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MÜLLER (K. O.). **Bemerkungen zur Frage der 'biologischen Spezialisierung' von Phytophthora infestans.** [Observations on the 'biologic specialization' of *Phytophthora infestans*.]—*Angew. Bot.*, xv, 1, pp. 84–96, 1933.

This is a commentary on Schick's conclusions [*R.A.M.*, xii, p. 390] with regard to biologic specialization in *Phytophthora infestans*.

In 1932 the writer obtained infection with the Streckenthin form of the fungus not only on the hitherto immune 'W' strains of potato but also on uncultivated varieties. It had previously been shown by one of the writer's collaborators, Dr. Pfeiffer, that the 'W' strains are not all equally immune from the common form of *P. infestans*, but may be divided into three groups, viz., (1) in which the tubers are susceptible and the fungus reaches the sporulation stage; (2) the parasite penetrates and destroys the tuber parenchyma but seldom forms spores; and (3) the development of the fungus is arrested shortly after entry into the host, and spores are never produced. The reaction of 40 'W' strains to the Streckenthin form of *P. infestans* was tested and in no case did the tubers show the degree of resistance characterizing the above-mentioned groups (2) and (3). Similar results were obtained with a few hybrids of *Solanum demissum* × *S. tuberosum* that had remained practically free from late blight in the field.

Discussing the origin of the Streckenthin form of *P. infestans*, two explanations are offered. It may either represent a permanent modification of the common form with enhanced virulence, or it may be a new biologic form. Schick's results with his *S. demissum* × *S. tuberosum* hybrids undoubtedly lend support to the latter view, though his experimental methods are considered to be open to criticism. Assuming, then, that biologic specialization within *P. infestans* exists, the Streckenthin form may have arisen as a mutant from some individual belonging to the common form. It may, on the other hand, already have coexisted for many years with the common form, but lacked opportunity for extension until the advent of suitable hosts in the shape of the 'W' strains, and of appropriate weather conditions such as prevailed in 1932. A further possibility is that the Streckenthin form was introduced into the v. Kameke seed selection establishment with foreign tubers.

In conclusion, the writer deals at some length with Schick's criticisms of his work and that of other investigators. In any case the 'W' strains have proved their value in respect of immunity from the great bulk of the German types of *P. infestans*, and pending further studies the inference that the fungus comprises sharply defined biologic forms is considered to be premature.

CAIRNS (H.) & MUSKETT (A. E.). **Phytophthora megasperma causing pink rot of the Potato.**—*Nature*, cxxxi, 3304, p. 277, 1933.

In January, 1930, a species of *Phytophthora*, identified by S. F. Ashby at the Imperial Mycological Institute as *P. megasperma*, the agent of a crown rot of hollyhocks in the United States [*R.A.M.*, xi, p. 303], was isolated from decayed potato tubers in Northern Ireland. *P. megasperma*, which differs from *P. erythroseptica* mainly in its large oospores and the production of a preponderance of paragynous antheridia, causes a pink rot indistinguishable from that due to the latter fungus. This is believed to be the first record of *P. megasperma* outside the United States.

COOK (W. R. I.). **On the life-history and systematic position of the organisms causing dry top rot of Sugar-Cane.**—*Journ. Dept. Agric. Puerto Rico*, xvi, 4, pp. 409–418, 3 pl., 1 diag., 1932.

Sugar-cane from Porto Rico affected with the dry top rot previously attributed to *Ligniera vascularum* [*R.A.M.*, viii, p. 603] showed three distinct types of spherical or subspherical spore-like bodies in the cells. The largest were thin-walled, frequently collapsed bodies 16 to 21 μ in diameter, and occurred almost exclusively in the larger vessels, where they were often so numerous as completely to block the passage. The second type measured 14 to 16 μ in diameter, had thicker, double-contoured walls, and contained a definite nucleus with one or two nucleoli. This type was less frequent than the first, and was rarely found in the large vessels, though it was present in the phloem, xylem parenchyma, and cortex. In size and structure these bodies corresponded with the spores of *L. vascularum* as described by M. T. Cook [loc. cit.]. The third spore type was irregular in shape, 10 to 12 μ in diameter, and each, when fully developed, consisted of a number of small spherical nucleated bodies containing a nuclear mass.

There also appeared to be two distinct types of amoeboid material from which the spore types were differentiated. The more easily recognizable type consisted of large masses with no apparent structure or nuclei, and corresponded to plasmodia. They were restricted to the large vessels and formed part of a life-cycle with the largest spore type. The other type consisted of much smaller elements restricted to the phloem and xylem parenchyma and showing structure and nuclei each with a single well-defined nucleolus. Finally, minute, spherical, very deeply staining bodies, probably bacteria, were frequently associated with the three spore types.

The author considers that the organism chiefly responsible for

the disease is the large amoeba and its associated large spore type. This organism he names *Amoebosporus vascularum* gen. et sp. nov. and cites *Plasmodiophora* [*L.*] *vascularum* p.p. as a synonym.

In the earliest stage found, the amoeba consisted of a uniform, undifferentiated mass of protoplasm in the spiral and annular tracheae and the pitted vessels of the vascular bundles. As they became larger the amoebae generally showed no further differentiation, but occasionally the protoplasm developed vacuoles. When mature, the amoebae completely filled the vessel in which they had been growing, and this appeared to stimulate reproduction. The protoplasm became traversed by lines in which solid material was laid down to form the walls of a number of spherical cysts each containing a single, central nucleus surrounded by granular cytoplasm. Later, the nucleus of each cyst split up and a small spherical protoplasmic mass formed round each part, which became a spore by the secretion of a cell wall around it. Eventually the spores were released and were found lying round the empty cysts, embedded in the protoplasm of the original amoeba. As far as the author was able to observe, the spores germinated to produce a small spherical body containing a distinct nucleus with a vacuole, the protoplasm becoming more vacuolated as the amoeba grew; the author is certain that the large amoebae were derived from these spores.

The second organism, *A. saccharinum* sp. nov. (syn. *P.* [*L.*] *vascularum* p.p.), differs from the first chiefly in the smaller size of the amoebae, cysts, and spores. It did not appear seriously to affect the host. The earliest stage found consisted of uninucleate amoebae in some of the cortical cells, phloem, and xylem parenchyma, but never in the xylem vessels. They were irregular in shape and were composed of a very fine granular protoplasm quite distinct from that of *A. vascularum*. The nucleus divided apparently by mitosis. Concurrently with nuclear division the amoeba increased in size. Large plasmodia were not found, though some contained six or seven nuclei. Finally, the amoebae became surrounded by a cyst wall and the contents divided up into small spherical cells containing a single nucleus. In some cases an apical flagellum developed after the spores (which were piriform, later rounded) had emerged from the cyst.

The third type of spore-like body (only occasionally noted) is thought to be possibly a stage in the life-history of some other organism.

The new genus, which bears no relationship to the Plasmodiophoraceae, is placed provisionally in the family Lobosa of the Rhizopoda (Protozoa), in which the pseudopodia are short, blunt, or absent. Latin diagnoses are given of the genus and the two species.

Bourne (B. A.). **Preliminary notes on a leaf disease of Sugar Cane in Florida.**—*Plant Disease Reporter*, xvii, 1, p. 8, 1933. [Mimeographed.]

Brown spot (*Cercospora longipes*) [*R.A.M.*, xi, p. 127] is reported to have been prevalent during the last two years in Florida on certain sugar-cane seedling progenies of Co. 281 × U.S. 1694 (a seedling of P.O.J. 213) e.g., F. 29–362, F. 30–62, and F. 30–64, this being

the first record of the disease in the United States. Some thin-stemmed varieties are so susceptible that the outer half of the foliage presents a blasted appearance due to the innumerable lesions. From the breeder's standpoint the disease has assumed considerable importance in the selection of new seedling varieties. The only commercial variety showing noticeable infection is Co. 281, the thick-stemmed P.O.J. canes, 2714, 2725, and 2878, and the 'noble' S.C. 13/4 being practically immune.

Cook (W. R. I.). **The parasitic slime-moulds.**—*Hong Kong Naturalist Supplement, 1932*, 1, pp. 29–39, 6 pl., 1 fig., 1932.

In order to encourage the search for parasitic slime moulds (Plasmodiophorales) in eastern Asia (whence none of the twelve known species has yet been recorded), the writer gives critical and taxonomic notes on the genera *Plasmodiophora* (with the life-history of *P. brassicae*), *Sorosphaera*, *Sorodiscus*, *Spongospora*, *Tetramyxa*, and *Ligniera* [see next abstract]. The following new combinations are made: *P. diplantherae* (Ferd. & Winge) Cook (= *Ostenfeldiella diplantherae* Ferd. & Winge); and *Spongospora campanulae* (Ferd. & Winge) Cook (= *Clathrosorus campanulae* Ferd. & Winge).

Palm (B. T.) & Burk (Myrle). **The taxonomy of the Plasmodiophoraceae.**—*Arch. für Protistenkunde*, lxxix, 2, pp. 263–276, 15 figs., 1933.

The recent examination of galls on the subaerial adventitious roots of the main axis and on the petioles of a *Veronica americana* plant in Colorado showed the presence of a number of spore masses of the type of those of *Sorosphaera veronicae*, whereas others displayed equally typical *Spongospora*, *Ligniera*, *Clathrosorus*, or *Sorodiscus* characters [see preceding abstract]. Allowing for considerable intergradation, three groups of spore masses could be distinguished, viz., the hollow sphere type characteristic of *Sorosphaera* (*sensu* Schroeter *non* Fitzpatrick), the flattened ellipsoid or double plate (*Sorodiscus*), and the sponge-like (*Clathrosorus*). The more compact masses may be compared with the typical spore arrangement of *Spongospora*.

In a number of cases the mature spores of the various types were furnished with thickened, verrucose walls, the presence of which has been made the main distinguishing feature of *L. verrucosa* Maire & Tison (*Ann. Mycol.*, vii, p. 226, 1909).

It is apparent from this case and from the literature that the arrangement of the spore masses in this kind of gall is governed by the cellular constitution of the host, and it must therefore be assumed that the several types of aggregation here described belong to a single species of the Plasmodiophoraceae. It would thus seem logical to exclude genera founded purely on such a variable character as spore arrangement, and the following would become synonyms of *Sorosphaera* Schroeter 1886: *Spongospora* Brunchorst 1887, *Ligniera* Maire & Tison 1911, *Sorodiscus* Lagerheim & Winge 1912, *Ostenfeldiella* Ferdinandsen & Winge 1914, *Clathrosorus* Ferdinandsen & Winge 1920, and *Membranosorus* Ostenfeld & Petersen 1930. Of the other allied genera that

have been described, including Woronin's *Plasmodiophora*, only *Cystospora* Elliott would appear to occupy a separate position by reason of its more complicated spore formation. The writers accordingly propose to unite all the hitherto described genera of the family (except *Cystospora*) into one genus which must be known by nomenclatorial rules as *Plasmodiophora* (1878).

Discussing the position of *L. verrucosa*, the authors cannot accept the verrucose cell walls as a diagnostic character considering its presence in certain spore aggregations and absence from others in *V. americana*, so that this species must be regarded as a synonym of *Sorosphaera veronicae*. *L. radicalis*, *S. junci*, and *Sorodiscus callitrichis* are also considered to be identical with *S. veronicae*.

LARSEN (P.). **Fungi of Iceland.**—*ex* The Botany of Iceland, ii, 3, pp. 451–607, 1 col. pl., 20 figs., 1932.

A list, supplemented by critical and taxonomic notes, is given of 802 fungi collected by the writer in Iceland since 1921, special attention having been paid to the Hymenomycetes. There is a supplementary list of six fungi collected by L. Harmsen and S. Steindórsson and sent to the writer by A. Lund. A six-page bibliography and host and fungus indexes are appended.

UNAMUNO (L. M.). **Más especies de hongos microscópicos de nuestro Protectorado marroquí.** [Further species of microscopic fungi from our Moroccan Protectorate.]—*Bol. Soc. Española Hist. Nat.*, xxxiii, 1, pp. 31–43, 6 figs., 1933.

In this second annotated list of Moroccan fungi [cf. *R.A.M.*, xii, p. 395], critical and taxonomic notes are given on 44 species, of which five are considered to be new to science and furnished with Latin diagnoses. *Puccinia gladioli* was found on one leaf only of *Gladiolus illyricus* var. *reuteri*, producing rectangular black spots, 2 to 3 by 1 to 1·5 mm. *Tilletia narduri* n. sp. was found infecting the ovaries of *Nardurus lachenalius* [*Festuca poa*].

MARTYN (E. B.). **Preliminary list of diseases of economic plants in British Guiana.**—*Kew Bull. Misc. Inform.*, *1933*, 2, pp. 107–110, 1933.

A list is given, in alphabetical order of the hosts, of the fungi and diseases (physiological and virus) affecting 31 plants of economic importance in British Guiana. The records of many of the diseases not observed of recent years are taken from Departmental Reports or from Nowell's 'Diseases of Crop Plants in the Lesser Antilles'.

AGANOSTOPOULOS (P. T.). **Some diseases of fruit trees, vegetables and flowers caused by Fusarium sp. in Greece.**—23 pp., Athens, A. B. Pasca, [? 1932.—Greek, with English summary. Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 1, p. 15, 1933.]

Fusarium oxysporum is stated to be responsible for the following diseases in Greece: blackening of *Pistacia vera*; pear cankers; gummosis of almond, cherry, and apricot; potato and tomato wilts;

chlorosis, root rot, and sterility of broad beans (*Vicia faba*); and onion rot. Species of *Fusarium* are also implicated in stem rot of carnations, and stock [*Matthiola*] and aster wilt [*R.A.M.*, xii, p. 448].

LUDBROOK (W. V.). **Pathogenicity and environal studies on Verticillium hadromycosis.**—*Phytopath.*, xxiii, 2, pp. 117–154, 5 figs., 3 graphs, 1933.

A comprehensive account is given of the writer's studies, conducted at the University of Wisconsin, on the pathogenicity and environmental relations of the agents of hadromycosis of plants, *Verticillium dahliae* and *V. albo-atrum*, the retention of which as separate species is advocated [*R.A.M.*, x, p. 757; xii, p. 117].

Eight cultures of *V. albo-atrum* and 37 of *V. dahliae* were investigated, isolated from 20 different hosts belonging to 17 genera in the United States, Australia, England, and Germany (*V. dahliae* only). Both fungi made approximately equal growth in culture at 22° C., but at 28° the average development rate of *V. albo-atrum* was reduced to about one-quarter of that of *V. dahliae*. The latter organism made varying amounts of growth at 30°, whereas *V. albo-atrum* failed to develop at this point.

Of 15 recorded hosts inoculated with *V. dahliae* under parallel field conditions, severe symptoms were shown by eggplant, okra [*Hibiscus esculentum*], cotton, snapdragon (*Antirrhinum*) [*majus*], and rose; mild ones by wild sumac (*Rhus typhina*), blackberry, and raspberry; and none by potato, tomato, pepper, cucumber, dahlia, lupin, and sweet pea, though the two first named were successfully inoculated under greenhouse conditions. *V. albo-atrum* attacked potato, tomato, and eggplant, the first two showing little or no symptoms except in the greenhouse tests. In soil temperature experiments on eggplants in tanks, *V. dahliae* produced marked signs of infection at a range of 12° to 30°, while *V. albo-atrum* was pathogenic at and below 28°, the air temperature being between 19° and 23° in each case.

No appreciable effect on the severity of hadromycosis in the eggplant was exercised by soil moisture variations between 45 and 95 per cent. of the moisture-holding capacity.

It was found difficult to obtain infection on field-grown plants, especially the relatively resistant tomato and potato, under conditions favouring the development of the disease in soil-temperature tanks. It would appear, therefore, that some factor other than temperature must have lessened the susceptibility of the field-grown plants to the fungi concerned. These facts are discussed in relation to the hypothesis of continuous competition between host and parasite.

JOCHEMS (S. C. J.). **Ziekten der Tabak.** [Tobacco diseases.]—*ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1932.** [Survey of the diseases and pests of Deli Tobacco in the year 1932.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxxiii, pp. 3–21, 1933.

As in former years, slime disease (*Bacterium solanacearum*) caused the heaviest damage to the Deli tobacco crops in 1932, the incidence of infection among the 57 plantations inspected ranging

from 0·3 to 22·7 per cent. On some of the up-country plantations slime disease assumed an abnormal form recalling top rot (*Bact.* [*Bacillus*] *aroideae*) [*R.A.M.*, xii, p. 332].

Black rust (*Bact. pseudozoogloeae*) [ibid., x, p. 62] was more prevalent than for some years past on up-country plantations, where an abnormally heavy rainfall was experienced in March and the first half of April.

Compared with the losses due to slime disease, those caused by *Phytophthora* [*parasitica*] *nicotianae* [ibid., xii, p. 118] are insignificant. However, in four of the 18 plantations affected by this disease over 100 seed-beds were destroyed. Field observations showed that infection may be carried by river water on to the plantations; five rivers were found to be infected.

Stem scorch (*Pythium* spp.) [ibid., xi, p. 333] was responsible for unusually heavy damage in 45 plantations, where an incidence of 25 per cent. was not uncommon.

Rotterdam B disease [loc. cit.], the most important virus disturbance of Deli tobacco after mosaic, was reported from 17 plantations, 15 of which are on alluvial soils. 'Korab' was observed in five plantations on various types of soil, being much less prevalent, however, than 'gilah' [ibid., xi, p. 478]. 'Daon lidah', characterized by narrow, pointed leaves with a diffuse yellow coloration, affected over 100,000 plants on two plantations in the plains. This disease is evidently also due to a virus; it is transmissible from *Physalis angulata* to tobacco but not always in the reverse direction. Grafting of diseased scions on healthy stocks and vice versa resulted in 100 per cent. infection.

VALLEAU (W. D.). **Seed transmission and sterility studies of two strains of Tobacco ringspot.**—*Kentucky Agric. Exper. Stat. Bull.* 327, pp. 43–80, 12 figs., 1 graph, 1932. [Received April, 1933.]

Two distinct strains of the tobacco ring spot virus [*R.A.M.*, xi, p. 133] are widely distributed in Kentucky, one of which ('green' ring spot) produces the well-known chlorotic green patterns, whereas the other ('yellow' ring spot) produces yellow lines, while the whole leaf bleaches slightly or turns light yellowish-green to nearly white. In suckers of White Burley tobacco after cutting two distinct kinds of symptoms may develop, according to which strain is present. On some plants the suckers may be golden yellow with few or no necrotic rings, whereas on others they may be green with typical rings. Seedlings from seed taken from green ring spot plants usually remained almost normal in appearance, while those from yellow ring spot plants turned yellow soon after germination and had a bleached, yellowish-green appearance throughout growth. On Turkish tobacco plants in the greenhouse the early symptoms following inoculation with the two types were often identical and were characterized by necrotic single, double, or triple rings on the younger, rubbed leaves. In yellow ring spot, however, there soon appeared a marked tendency towards yellowing, especially in the new leaves, and this developed in small (gradually enlarging) spots or as chlorotic, yellowish rings, the neighbouring tissue turning yellow and developing

prominent spots. In green ring spot the chlorotic line patterns sometimes developed in the same way, except that the paler tissue was light green. After the necrotic rings had appeared, plants affected with the green type grew almost normally, but leaves showing the yellow type gradually became chlorotic towards the tip.

As ring spot was not transferred from Cobbler potatoes affected with aucuba mosaic [ibid., x, p. 410] to tobacco by rubbing or grafting, and as the aucuba symptoms differed from those of ring spot, these diseases are considered to be distinct. Both types of ring spot, however, were obtained from naturally affected potatoes and transferred to tobacco. Inoculations of Cobbler potatoes gave negative results by rubbing, but positive results by grafting. Ring spot was transferred to tobacco from *Solanum carolinense*, which appears to be a common carrier of the virus.

Both strains of the virus were transmitted through seed from affected plants. Seedlings affected by the green strain sometimes showed no symptoms unless subjected to abnormally low temperatures. Some plants from infected seed showed none of the usual signs of ring spot, but the older leaves developed small chlorotic patches between the tertiary veins, this chlorosis spreading upwards after the plants bloomed; it is regarded as probably a milder form of the bleaching characteristic of the yellow type.

When young, rapidly expanding leaves of ring spot plants were exposed to low temperatures (50° to 60° F.) the tissues near the margins became chlorotic to necrotic, the leaves later becoming distorted and pinched.

Yellow ring spot seedlings grew slowly and were scarcely suitable for setting in the field, whereas those affected with green ring spot grew rapidly and if set in the field could have served as a source of infection. It is considered that tobacco seed has probably been a factor in the geographical distribution of the green ring spot but not to any significant extent of the yellow ring spot virus. It appears that the fewer the seed produced on diseased plants the higher the percentage of infection. The percentage of seed infection was lower with normal pollen than with pollen from ring spot plants. On the Experiment Station farm, however, seed was not the primary source of green ring spot infection. In years when green ring spot is prevalent, its distribution is not of the random character to be expected from seed transmission, but suggests insect transfer from perennial plants. The presence of yellow ring spot in the plantings could not be attributed to seed transmission.

In view of the little injury caused by ring spot in Kentucky, where in 1931 out of 376,360 plants examined only 0·16 per cent. were affected and most of these not appreciably, the only control measure being considered is the elimination of ring spot plants from crops raised primarily for seed.

The abnormally low seed production of ring spot plants appears to be due to partial pollen sterility resulting from microspore infection. On ring spot plants microspore development appears to be normal for some time after liberation from the tetrad; the walls develop normally and the cytoplasm increases in volume, but most

of the grains are under-sized when the anthers are mature. The veinbanding, healthy potato, tobacco mosaic (severe), and cucumber mosaic type 3 viruses alone or in combination had little or no effect on pollen development. It is suggested that a study of pollen development on an affected plant may indicate whether or not embryo infection is likely to occur with a given virus.

A bibliography of 22 titles is appended.

HENDERSON (R. G.). **Increasing the resistance of Tobacco ring spot virus to aging in vitro.**—Abs. in *Phytopath.*, xxiii, 1, pp. 14–15, 1933.

A small quantity of carbolic acid added to the expressed juice of ring spot tobacco plants [see preceding abstract] has been found to prevent the ageing of the virus *in vitro*. Virus-infected juice to which sufficient 5 per cent. carbolic acid solution was added to make a concentration of 0·25 per cent. was highly infectious after seven days' incubation at 27° C., whereas the virus in juice treated with toluene was not infectious on the seventh day, and that in untreated juice had lost its virulence by the third.

WOODS (M. W.). **Intracellular bodies in ring spot.**—Abs. in *Phytopath.*, xxiii, 1, p. 38, 1933.

Intracellular bodies, resembling those of tobacco mosaic, have been found in primary and systemic ring spot lesions in Turkish tobacco and in primary lesions in Havana Seed-Leaf, *Nicotiana rustica*, *N. glutinosa*, and *Petunia* [*R.A.M.*, xii, p. 120 and preceding abstracts]. After fixation in formol-acetic alcohol and staining with Fleming's triple stain, the bodies appeared typically granular, vacuolate, with or without membrane-like surfaces, and in *Nicotiana* they sometimes contained minute, red, cuboidal inclusions which were also present in the cytoplasm and nuclei of diseased and healthy cells. Intracellular bodies were found in the cells of the mesophyll, epidermis, and trichomes, their development being apparently directly correlated with the formation of visible foliar lesions. Such bodies were more common in older lesions, though they were also observed five days after inoculation. Tests with Turkish tobacco and *N. glutinosa* failed to reveal the presence in the affected plants of any virus other than that of ring spot.

VALLEAU (W. D.). **A virus disease of Delphinium and Tobacco.** —*Kentucky Agric. Exper. Stat. Bull.* 327, pp. 81–88, 4 figs., 1932. [Received April, 1933.]

Garden varieties of perennial delphinium at Lexington, Kentucky, and Yonkers, New York, are affected by a virus disease somewhat resembling tobacco ring spot [*R.A.M.*, viii, p. 425, and preceding abstracts] but due to a different virus. Chlorotic ring patterns appear on the leaf, following the primary veins. The patterns may or may not be present in spring, but usually become more prominent as the leaves grow older. After blossoming, some or all of the leaves may bleach to a light greenish-yellow.

Inoculations from affected delphiniums to Turkish tobacco plants in the greenhouse gave necrotic ring and line patterns apparently identical with the early symptoms of coarse etch of tobacco [ibid.,

x, p. 60]. If the necrosis on the inoculated Turkish tobacco was very slight the subsequent leaves appeared to be normal or showed occasional faint chlorotic line patterns visible only by transmitted light. If, however, the necrotic patterns were more extensive on the inoculated leaves, the next ones were sometimes distorted as a result of extensive necrotic line patterns and chlorosis. Subsequent leaves were either normal or were small, light green, and slightly distorted, with small, necrotic line patterns here and there. In its general appearance the disease resembled that produced by one of the mild cucumber mosaics. The virus was transferred from tobacco to delphinium by rubbing, and from apparently healthy leaves of affected delphinium to tobacco, on which it again produced the necrotic line disease. The disease was found on tobacco growing in the field in Kentucky and Minnesota: a virus obtained from Burley and Turkish tobacco plant beds at Lexington and from tobacco plants in the field, when transferred to tobacco in the greenhouse, produced a disease quite similar to that produced by the delphinium virus. In White Burley tobacco plants from St. Paul, Minnesota, the author found a virus, either alone or mixed with the veinbanding virus, apparently identical with the delphinium virus in Kentucky; transferred to tomato and cucumber it produced systemic infection. In the last-named host the viruses obtained from delphinium, tobacco plant beds, and a tobacco field in Kentucky, as well as from Minnesota tobacco all produced a conspicuous mosaic.

The delphinium virus, which readily infects cucumbers, differs from that of tobacco mosaic in the symptoms produced, host range, and its inability to withstand drying. It differs from the etch and veinbanding viruses in possessing a wide host range (including members of the Ranunculaceae, Solanaceae, and Cucurbitaceae). It appears to differ from tobacco ring spot in not affecting pollen development or causing sterility, but it resembles it in its wide host range and the patterns produced.

KERLING (L. C. P.). **The anatomy of the 'kroepoek-diseased' leaf of Nicotiana tabacum and of Zinnia elegans.**—*Phytopath.*, xxiii, 2, pp. 175–190, 10 figs., 1933.

The writer's anatomical studies on tobacco leaves affected by the 'common' and 'transparent' types of kroepoek [leaf curl] received from Java [*R.A.M.*, xi, p. 478] are fully described. 'Common' kroepoek is characterized by a disturbance of sugar transport throughout the leaf, even in the externally healthy-looking parts; an increase of the primary phloem in the veins; the enlargement of the pericycle through cell division; the formation of new woody vessels surrounded by a cambium, so that new steles arise inside the old pericycle; and the loss of dorsiventrality in the leaf, in tobacco through the substitution of palisade for spongy parenchyma, and in *Zinnia elegans*, which the writer found affected by a similar disease at Djokjakarta (Java) and which Thung [loc. cit.] has shown to harbour the kroepoek virus, through the formation of a loose, irregular palisade parenchyma with large intercellular spaces. Furthermore, palisade parenchyma and stomata are formed in the lobed veins of the affected tobacco leaf; the lobes after-

wards develop into secondary leaflets [enations] in which the new steles proceed in reverse orientation. These new leaflets lie with the morphological underside against the underside of the old leaf. The increased assimilation brought about by the formation of a new palisade tissue and new laminae cannot fail to augment the quantity of starch, but the amount of calcium oxalate undergoes no alteration.

The 'transparent' type of kroepoek produces in the leaf veins typical swellings of the ends of the xylem vessels and sieve-tubes and enlargement of the pericycle and cortical parenchyma cells. The sieve-tubes are curved and the cell walls of the primary phloem, as well as those of the pericycle, are irregularly swollen. The pericycle breadth is increased from $\pm$ 60 μ in the normal leaf to $\pm$ 250 μ in diseased ones, and the individual cells are sometimes up to 120 μ in diameter. There is much secondary phloem, still apparently functioning.

In spite of the fact that the two types of kroepoek under observation are transmissible by the same insect (a species of *Bemisia* of the family Aleyrodidae), the writer regards them as morphologically and anatomically distinct, and is even inclined to doubt whether the 'transparent' form is correctly classified as kroepoek. The permanence of the two types in inoculation tests points to the implication of two different viruses. The symptoms of 'common' kroepoek correspond with those described by Penzig (Pflanzenteratologie, 2nd edn., 1921–2) as being associated with doubling of the leaf blades and leaf reversion in tobacco (Vol. III, p. 82), and with new ventral and dorsal formations on the midrib of the leaves of other plants (Vol. II, p. 106). Both Penzig and Janse (*Ann. Jard. Bot. Buitenzorg*, xl, p. 87, 1929) refer these teratological manifestations (named by the latter 'splitting phenomena') to abnormalities of the enzymes or growth substances. In the case of kroepoek, the virus transferred by the whitefly causes the splitting of the tobacco leaf and the loss of dorsiventrality in *Z. elegans*. This does not, however, explain how the virus acts in the plant, the first visible deviation in which is an accumulation of starch. Associated with the latter may be the abnormal behaviour of the sieve-tubes and enzymatic disturbances, but the influence of food accumulation on the formation of new steles and on the laminae, with the consequent local loss of dorsiventrality, has yet to be determined.

BORDELEAU (R.). **A few remarks regarding the eradication of the disease known as wild fire in the Tobacco plantations in the Yamaska Valley.**—*Twenty-third and twenty-fourth Ann. Repts. Quebec Soc. Protect. Plants, 1930–1932*, pp. 173–176, 1932. [Received May, 1933.]

By means of stringent sanitary precautions aimed at the prevention of the spread of infection in the field, supplemented by seed-bed disinfection with 1 in 50 formalin ($\frac{1}{2}$ gall. per sq. ft.), tobacco wildfire (*Bacterium tabacum*) is stated to have been completely eliminated from the Yamaska Valley, Quebec, where it caused heavy damage in 1928 [*R.A.M.*, x, p. 132].

Dufrénoy (J.). **Modifications pathologiques du métabolisme cellulaire chez les Tabacs.** [Pathological modifications in the cellular metabolism of Tobacco.]—*Ann. des Epiphyties*, xviii, 4, pp. 259–280; 5, pp. 281–316, 1 pl., 29 figs., 1932. [Received May, 1933.]

This fully documented review of the present state of knowledge concerning the cellular constants of the tobacco plant and the variations that may be set up in them, deals with the subject under the following main headings: tobacco seedling growth, the cellular constants, proteogenesis and proteolysis, amylogenesis and amylolysis, effects of ultra-violet rays on tobacco leaves, effects of virus attack on the chondriome and on cellular metabolism, the reaction of the leaves to attack by *Bacterium tabacum*, the effects of various disinfectants on the germination of the seed, and the cytological effects of metabolic disturbances.

The author's own researches on the effects of parasitic diseases of tobacco on the cell contents have been noticed in this *Review* from time to time [cf. *R.A.M.*, x, p. 132; xi, pp. 480, 796, 807].

Hopkins (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 5. Evil effects of delayed 'priming'.**—*Rhodesia Agric. Journ.*, xxx, 2, pp. 120–123, 1933.

In 1932 late rains induced much leaf spotting of tobacco all over Rhodesia, frog eye (*Cercospora nicotianae*) [*R.A.M.*, xi, p. 677] being particularly destructive, especially in the curing sheds, while brown spot (*Alternaria tabacina*) [ibid., xi, p. 135] and the shot hole disease due to a species of *Phyllosticta* (possibly *P. nicotiana* or an undescribed form) [ibid., xi, p. 206] completely destroyed a number of late-planted crops in areas where these diseases had not previously been recorded. The author describes how infection spreads from spores present on the lower seed-bed leaves when transplanted to the field and strongly emphasizes the fact that infection can only be checked by the complete removal in December of the lower leaves of the young plants. If the seedlings have become yellow and spotting is general, every unfolded leaf must be removed and the plants stripped to the bud. Priming should not, however, be begun until the plants have put out several new leaves, in order that plants affected by mosaic may be detected and dealt with.

Böning (K.). **Über eine zweite Brennfleckenkrankheit des Tabaks, hervorgerufen durch einen Pilz aus der Gattung Gloeosporium Desmaz. et Mont.** [On a second anthracnose disease of Tobacco, caused by a fungus of the genus *Gloeosporium* Desmaz. et Mont.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 11, pp. 253–255, 1 fig., 1933.

In September, 1932, the writer examined a sample of tobacco (*Nicotiana rustica*) leaves from Königsberg showing a brown discoloration and a blistered appearance. The fungus isolated from the diseased material resembled *Colletotrichum tabacum*, the causal organism of the tobacco anthracnose which the author described in 1929 [*R.A.M.*, xi, p. 753] but was devoid of setae. Inoculation experiments on *N. rustica* gave positive results after a relatively

lengthy incubation period of four weeks, the older leaves being most severely affected. The organism reisolated from the infected areas again produced conidiophores without setae. In cultural characters the Königsberg fungus also differed from *C. tabacum*, its mycelium being hyaline to light brown, flocculent, and slow growing, in contrast to the greenish-black, pulverulent, and rapidly developing mycelium of the previously recognized agent of anthracnose. The conidia of the species under discussion are, moreover, smaller than those of *C. tabacum*. On account of these differences it is referred to the genus *Gloeosporium* and the provisional name *G. nicotianae* is given to it.

The conidiophores of the second anthracnose fungus measure 6 to 18 by 2 to 7 μ (older ones up to 12 μ in width) and the conidia 8 to 18 by 2 to 5 μ. In pure culture rust-coloured to dark brown bodies (probably immature perithecia), 50 to 200 μ in diameter, may also be observed; they are filled with fatty hyphae but degenerate before reaching maturity.

Swanback (T. R.) & Jacobson (H. G. M.). **Brown root rot of Tobacco.**—*Science*, N.S., lxxvii, 1989, p. 169, 1933.

Laboratory and field investigations in Connecticut have shown that a form of brown root rot of tobacco [*R.A.M.*, xi, p. 496] is due to the insufficient intake of calcium by the plant. This condition may be induced by lack of available calcium, an excess of magnesium over calcium, or the presence of appreciable amounts of ammoniacal in relation to nitrate nitrogen.

Köhler (E.). **Viruskrankheiten an Tomaten und Gurken unter Glas.** [Virus diseases of Tomatoes and Cucumbers under glass.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 2, pp. 11–13, 1933.

A concise summary is given of the available knowledge concerning the virus diseases of glasshouse tomatoes and cucumbers, notes on which have appeared from time to time in this *Review*.

Sengbusch (R. v.). **Das Verhalten von Solanum racemigerum gegen den Erreger des Tomatenkrebses (Didymella lycopersici).** [The reaction of *Solanum racemigerum* towards the agent of Tomato canker (*Didymella lycopersici*).]—*Der Züchter*, v, 2, pp. 3–4, 1933.

Solanum racemigerum, a wild near relative of the cultivated tomato previously shown to be immune from leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xii, p. 250], was similarly tested under controlled conditions in Berlin for its reaction to canker (*Didymella lycopersici*) [ibid., xii, p. 315]. The latter fungus, however, proved equally destructive on the inoculated plants of the wild and cultivated species at three different stages of growth—three days, three weeks, and two months, all being destroyed while the controls remained healthy. Hitherto none of the tomato forms tested for their reaction to *D. lycopersici* has given any indication of resistance, so that the work of breeding for immunity presents great difficulties.

Tikka (P. S.). **Metsäpatologisen tutkimuksen tehtävistä suomessa.** [Research problems in connexion with the pathology of forest trees in Finland.]—*Silva Fennica*, 24 (*1932*), 24 pp., 1932. [Finnish, with German summary.]

Following some general observations on the basic principles and problems of phytopathology, with special reference to silvicultural systems, the writer very briefly describes the diseases of forest trees in Finland, arranged in order of causation by climatic, pedological, botanical, zoological, cultural, and various other factors, e.g., those involved in enzymatic, teratological, and hereditary conditions, and the phenomena accompanying adaptation and recovery. The diseases are further grouped according to their localization in the tree: needle, leaf, bud, branch, stem, and root, more exactly defined under the upper and lower crown branches, the basal, middle, and top portions of the stem, and the different parts of the roots. The development and intensity of the diseases are considered in relation to statistical data, and control measures, based on rational silvicultural procedure, are discussed.

Ziebarth (F.). **Die hauptsächlichsten starken Schäden an Forstgehölzen im Jahre 1932.** [The principal severe injuries of forest trees in the year 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 2, pp. 10–11, 1933.

Notes are given on the distribution and prevalence of a number of fungous diseases and insect pests attacking deciduous trees and conifers in German forests during 1932. The numerous reports from Saxony indicate that this province suffered the most severe and extensive injury from these sources.

Roepke (W. K. J.). **Kort verslag over het Iepenziekte-onderzoek, verricht op het Laboratorium voor Entomologie te Wageningen, gedurende het jaar 1932.** [A brief report on the Elm disease investigation conducted at the Entomological Laboratory, Wageningen, during the year 1932.]—*Tijdschr. over Plantenziekten*, xxxix, 1, pp. 16–17, 1933.

A summary is given of the investigations in progress at Wageningen on the control of the elm sap beetles [*Scolytus scolytus* and *S. multistriatus*], which are implicated in the transmission of the elm die-back [*Ceratostomella ulmi*], by biological and chemical methods [*R.A.M.*, xi, p. 138; xii, p. 126, *et passim*]. These are still in the experimental stage and no conclusive results are as yet forthcoming.

Westerdijk (Johanna). **Kort verslag over het Iepenziekte-onderzoek, verricht op het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn, gedurende 1932.** [A brief report on the Elm disease investigation conducted at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1932.]—*Tijdschr. over Plantenziekten*, xxxix, 1, pp. 17–20, 1933.

During 1932 over 4,000 inoculations were made on American, Asiatic, and European elm seedlings to determine their reaction to *Ceratostomella ulmi* [*R.A.M.*, xi, p. 484]. The tests were conducted in eight localities in Holland and one in Belgium (Antwerp).

As in previous trials, all the American species showed a high degree of susceptibility. *U. laciniata* [var.] *nikkoense* may be added to the list already given of resistant Asiatic species. Most of the European species also proved susceptible to infection by *C. ulmi*, but in the current year's tests three varieties of *U. foliacea* (*dampieri*, *wredei*, and *marmorata*) gave evidence of resistance, as did also *U. monumentalis*, *U. glabra* [var.] *fastigiata*, *U. hollandica* [var.] *vegeta*, and *U. procera*. Some 30 seedlings of *U. glabra* and *U. foliacea* have been selected and will be subjected to further tests in the hope of developing resistance on a commercial scale.

No correlation has been detected between the anatomical structure of the wood and the reaction to *C. ulmi*, and negative results were also given by an attempt to establish a connexion between the extent of transpiration by the foliage and resistance or susceptibility to the disease.

NARASIMHAN (M. J.). **Cytological investigation on the spike disease of Sandal, Santalum album.**—*Phytopath.*, xxiii, 2, pp. 191–202, 2 figs., 1933.

The writer describes the results of his cytological study on spike disease of sandal (*Santalum album*) [*R.A.M.*, xii, p. 129], the annual losses from which in southern India are estimated at nearly 6 to 7 lakhs of rupees [£45,000 to £52,000].

The material used in the investigations was obtained in part from naturally infected areas near the towns of Bangalore and Mysore, supplemented by plants inoculated by grafting and by the pendulous branches characteristic of the 'willow' type of spike occurring in Tumkur [Mysore State]. The intracellular bodies associated with the disease were found to react to Goodpasture's carbolanilin-fuchsin stain (which is stated not to have been previously used in plant virus work) similarly to those found in animal virus diseases, such as rabies and epithelioma contagiosum. They are generally round or oval, often with a wavy outline and small, pseudopod-like projections, and have a maximum diameter of 4·3 to 8·7 μ. The bodies are generally composed of a reticulate matrix containing one or more (up to 11) vacuoles of different sizes. As many as seven proliferations have been observed in some of the intracellular organisms, and it is believed that the minute bodies distributed in certain cells may arise as a result of the cutting off of these processes. No definite evidence of independent movement on the part of the intracellular bodies was obtained.

In the diseased leaf cells the chloroplasts are stimulated to form an excess of starch and in the later stages they disintegrate. The nuclei in proximity to the intracellular bodies present a flattened or dented appearance, and in extreme cases may be crescent-shaped and shrivelled, as in Fiji disease of sugar-cane [ibid., iii, p. 607].

POMERLEAU (R.). **Present status of the White Pine blister rust in the province of Quebec.**—*Twenty-third and Twenty-fourth Ann. Repts. Quebec Soc. Protect. Plants, 1930–1932*, pp. 176–198, 12 figs., 2 maps, 1932. [Received May, 1933.]

Some of the information in this report on the present incidence

and distribution of white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*] in Quebec has already been noticed from another source [*R.A.M.*, xi, p. 553], but the following additional points are of interest. The disease was first observed on gooseberry bushes at St. Anne de Bellevue and Oka in 1916, and on white pines in Portneuf county in 1918. The estimated total volume of white pine in the Province of Quebec is 25 billions f.b.m., which would give a value, at $4·00 per m.f., of $100,000,000 for this species of tree as it stands in the forest. Notes are given on the results of an inspection of the white pine nurseries in certain counties, and on the establishment of a protective zone round the Provincial nursery at Berthierville [cf. ibid., xii, p. 356].

Graser (H.). **Zur Beurteilung und Abwehr des Tannensterbens.** [On the recognition and prevention of the die-back of Firs.]—*Die Kranke Pflanze*, x, 2, pp. 15–21; 3, pp. 39–42, 1 pl., 3 figs., 1933.

A detailed account is given of the writer's inspection of the silvicultural districts of Saxony in connexion with the die-back of silver firs [*Abies pectinata*: *R.A.M.*, vii, pp. 350, 686], which he attributes primarily to an inadequate water supply and consequent failure of the root system; insects, smoke injury, the attacks of *Armillaria mellea*, and other causes that have been assigned are considered to be purely secondary. Most of the affected areas are hill slopes or plateaux, and the die-back reached its greatest severity after the drought of 1921 and the injury by certain insects in 1922–3. In some localities trees of 70 years or more were mainly affected. Suggestions are made for improvements in the general conditions of the trees.

Martinez (J. B.). **Una grave micosis del Pino observada por primera vez en España.** [A serious mycosis of the Pine observed for the first time in Spain.]—*Bol. Soc. Española Hist. Nat.*, xxxiii, 1, pp. 25–30, 6 figs., 1933.

Young *Pinus pinaster* trees forming part of a reafforestation project on an estate in the municipal district of Rois, Corunna (Spain), near the coast at an altitude of 250 m. above sea level, have been extensively attacked by *Brunchorstia destruens* [*Crumenula abietina*: *R.A.M.*, x, p. 276; xi, p. 757], which also occurred to a lesser extent on *P. insignis* and *P. sylvestris*. The affected area presented the appearance of having been swept by fire owing to the prevalence of yellow, shrivelled needles. The morphology and taxonomy of the fungus, of which this is the first record in Spain, are discussed and control measures briefly indicated on the lines of those practised in Germany against leaf fall [*Lophodermium pinastri*: cf. ibid., viii, p. 685; xii, p. 68].

Migita (N.). **Resistance of some woods against the fungus.**—*Cellulose Indus.*, Tokyo, viii, 9, pp. 187–191, 1932. [Japanese, with English abstract, pp. 31–33.]

The results are reported of tests on the resistance to the wood-destroying fungus, *Polyporus vaporarius* [*Poria vaporaria*] of

four kinds of timber, namely, *Thujopsis dolabrata*, chestnut (*Castanea crenata*), *Abies firma*, and beech (*Fagus sieboldi*).

The durability of the wood flours obtained by grinding in a small mill so as to pass through a 1 mm. sieve was determined, after treatment with hot water, alcohol-benzene, or 1 per cent. alkali, by the inoculation of 2 gm. of each sample, soaked in distilled water, with a growing culture of the fungus, which was allowed to develop at 25° C. on the surface of the material for 100 days. After drying at 105° the average losses in dry weight for the different species were as follows: *T. dolabrata*, untreated 0 per cent., hot water 1·12, alcohol-benzene 13·01, and 1 per cent. alkali 10·54, the corresponding figures for chestnut being 0·58, 9·23, 2·50, and 6·19 per cent., for *A. firma* 9·14, 9·11, 11·10, and 5·91 per cent., and for beech 15·99, 14·81, 17·20, and 17·45 per cent., respectively.

Further experiments indicated that the durability of *T. dolabrata* is due to the toxicity to the fungus of its alcohol-benzene-soluble constituent, probably ethereal oil [cf. *R.A.M.*, xi, p. 812], while that of chestnut results from a similar property in its hot water-soluble components. *A. firma* and beech, on the other hand, possess no toxic substances either in their hot water- or alcohol-benzene-soluble constituents.

HUGHES (W.). **A study of Phoma lingam (Tode) Desm., and of the 'dry rot' it causes, particularly in Swede Turnips.**— *Scient. Proc. Roy. Dublin Soc.*, N.S., xx, 34, pp. 495–530, 2 pl., 1933.

A detailed study in Ireland of *Phoma lingam* and dry rot of swedes [*R.A.M.*, xi, pp. 134, 345] showed that the cotyledons, leaves, fleshy roots, siliquas, and seeds are affected. Cunningham's conclusions as to the existence of different strains of the organism [cf. ibid., ix, p. 218] were, in the main, confirmed. Organisms corresponding to his strains I, II, and III and their subdivisions were encountered, but could not always be separated on a basis of parasitic power. Strain I is not homogeneous in respect to its parasitic ability. Fungi isolated from swede seed, while referable on all grounds except parasitism to Cunningham's strain I B, were strongly parasitic to non-growing swede roots in the laboratory. The cultural characters used by Cunningham to separate strains I and II into forms A and B were also found to be somewhat unreliable. There was notable agreement, however, in the fact that the same form of the fungus was ascertained to be responsible for dry rot of swedes in Ireland and New Zealand, and that it fell into strain II. The author found that forms referable to strain II were invariably and exclusively associated with dry rot lesions on the fleshy roots and cotyledons, and with typical lesions on leaves which were not moribund; these were almost invariably II A forms, exactly as appears to be the case in New Zealand, though one II B form, isolated from a diseased cabbage stem, proved strongly pathogenic to swedes in the field. Forms corresponding to strains I and III occurred on dying leaves, roots showing other types of rot, and on the seed, but none of these fungi was able to produce dry rot in the field; III was always saprophytic, and

I at the most occasionally weakly parasitic. A table summarizing the classification according to Cunningham's grouping of over 331 isolations of *P. lingam* studied during a period of four years shows that strain II was isolated 142 times out of 144 from dry rot lesions on the fleshy roots, 35 times out of 35 from cotyledons, 69 times out of 73 from leaf lesions, and 22 times out of 25 from seeds. It is concluded that only strain II is of practical importance in the production of swede dry rot. Strain II B, practically never isolated from any part of diseased swedes except the seed, was yet predominant on all other cruciferous plants examined. This result was rather unexpected, since *P. lingam* as isolated from blackleg of cabbage in America was found in Ireland to belong to strain II A, and both in the laboratory and in the field it produced the severe rot characteristic of this strain in swedes. Limited trials indicated that in Ireland the typical *P. lingam* form of dry rot, corresponding to II A, causes little injury to cabbage stems. The conclusion was drawn provisionally that the comparative absence of cabbage blackleg in Ireland is due not to the absence of the parasite but rather to the fact that local conditions do not favour infection by it. The disease of plants of the cabbage family which does occur ordinarily in Ireland, and with which fungi of strain II B are associated, appears to be less serious than blackleg.

The forms included by Cunningham in his strains I and III differ from II A in their cultural characters rather more widely than does II B from II A, but it was not found possible to distinguish them morphologically. The occurrence in strain I B of a form which in laboratory inoculations was as strongly parasitic as II B to non-growing swede roots and only slightly different from the latter in cultural characters indicates that strain I comes within the limit of the species *P. lingam*; this classification is, however, made only provisionally, as there may be other accepted species of *Phoma* with which it agrees more closely. Thus, some forms included in strain I are morphologically closer to *P. destructiva* (Plowr.) C. O. Jamieson than to *P. lingam* and produce a rapid rot of tomato fruits. As regards strain III, the absence of morphological differences and its close similarity to many forms of strain I make it undesirable at present to separate it from the latter or to constitute a new species to contain it.

P. lingam was found in the outer portion of the testas of infected seeds, but not in the embryos of viable seeds.

The progress of dry rot originating from the seed, or from diseased roots of the previous year surviving in the soil or in farmyard manure, is described in detail and the relative importance of these three sources of infection is discussed. Extensive field experiments over a period of three years showed that the amounts of infection usually present on the seed were not capable of producing outbreaks as serious as those which originated from contamination in soil or manure.

Of 42 commercial lots of swede and turnip seed, comprising 164,050 seeds, 10 lots were found to be infected, the proportion of infected seeds averaging only 1 in 6,310. Only a small percentage of disease occurred in plots sown with contaminated seed when

precautions were taken to avoid contamination from the soil or manure, as against percentages exceeding 20 or 30 when contamination from soil or manure occurred.

P. lingam grew in sterilized potting soil, but not in unsterilized field soil.

The disease was found to spread extensively in storage pits, the greater part of the rot being due to superficial contamination or incipient lesions present on the roots when brought from the field, but further spread in the pits being favoured by humidity.

On two occasions *P. lingam* was found on charlock (*Sinapis arvensis*) [*Brassica sinapis*], associated with severe attacks on swedes [cf. ibid., x, p. 584].

A bibliography of 23 titles is appended.

WEHLBURG (C.). **Onderzoekingen over Erwtenanthracnose.** [Investigations of Pea anthracnose.]—Thesis, University of Utrecht (Hollandia-Drukkerij, Baarn), 65 pp., 4 pl., 7 figs., 8 graphs, 1932.

Spotting of peas in Holland is produced by three fungi, *Ascochyta pisi* which causes light brown spots, and *A. pinodella* and *Mycosphaerella pinodes*, the spots caused by which are darker brown to black [*R.A.M.*, xi, pp. 345, 759; xii, p. 137]. Of these the first-named was most frequently met with, but the injury caused by *M. pinodes*, which produces foot rot in addition to attacking the leaves, was much more serious. *A. pinodella* is a serious parasite of the hypocotyl and roots. A detailed description of the three fungi is given.

In pure culture experiments using Richards's solution as a base it was found that ammonium salts are a better source of nitrogen for all three fungi than nitrates; on ammonium chloride *A. pisi* attains a greater dry weight than on asparagin or peptone. Nitrite appears to be a good source of nitrogen, provided the nutrient solution has a basic reaction. When ammonium salts of strong acids were used as a source of nitrogen, the reaction of the nutrient solution was reduced to P_H 3·2, below which no growth is possible. Potassium nitrate, on the other hand, induced a rise in the P_H value of the medium to 8.

The development of *A. pisi* was studied at a range of P_H 3 to 9. At P_H 3·2 the fungus forms, in place of normal hyphae, irregular, greenish clumps consisting of thick, round cells, scattered over the surface of the medium. Above this point the growth is satisfactory, the hyphae being normal and covering the substratum with a compact layer. The best sources of carbon for *A. pisi* are dextrin, soluble starch, glucose, and saccharose; on galactose, lactose, and gum arabic growth is less profuse, and cellulose in the form of finely shredded filter paper is not utilized. Magnesium is essential to the growth of *A. pisi*, its omission from the nutrient solution causing almost entire cessation of development. Without phosphorus or sulphur development is poor; the fungus can tolerate very high concentrations (up to 10 per cent.) of phosphate. Calcium seems to stimulate the growth of *A. pisi*, considerably more fungus substance being produced in cultures containing appropriate amounts of calcium nitrate than in those with a

corresponding quantity of potassium nitrate. The optimum hydrogen-ion concentration for *A. pisi* was found to depend not only on the source of nitrogen, but also on that of carbon. With potassium nitrate-saccharose the optimum lies between P_H 4 and 4·9, while with ammonium chloride-saccharose it was from P_H 7·1 to 7·8. The substitution of dextrin for saccharose shifts the optima for potassium nitrate and ammonium chloride to 6·9 and 8, respectively.

The effects of fertilizers on the reaction of peas to attack by *A. pisi*, *A. pinodella*, and *M. pinodes* were investigated. The susceptibility of the host was found to be augmented by the application of nitrogen, phosphorus, and calcium, and lessened by that of potassium. The reproductive activities of the fungi were little affected by the use of fertilizers, except for the failure of pycnidial formation in the total absence of nitrogen.

Cook (H. T.). **Studies on the downy mildew of Onions, and the causal organism, Peronospora destructor (Berk.) Caspary.**— *Cornell Agric. Exper. Stat. Memoir* 143, 40 pp., 9 figs., 1 map, 1 graph, 1932. [Received April, 1933.]

This is a full account of the author's experimental and field studies of onion downy mildew [*R.A.M.*, xi, p. 689] which is stated to be one of the most widely distributed and serious diseases of the crop in most of the chief onion-growing areas of the United States. From a survey of the relevant literature he concludes that the causal organism should be known as *Peronospora destructor* (Berk.) Caspary, under which binomial it was listed by Berkeley in 1860, with a reference to an earlier description of the fungus by him in 1841 under the name *Botrytis destructor*. The specific name *schleideni* was first used six years later, in 1847, by Unger who referred the fungus to *Peronospora* without any mention being made in the Latin diagnosis of its perfect stage, for which reason the name cannot be valid according to the International Code of Nomenclature. In 1860 Berkeley stated that the oospores were known.

Cross-inoculations showed that *Allium schoenoprasum* must be added to the host range of the fungus. No differences were noticed in the relative susceptibility of 53 [named] varieties of common onion which were tested, and it was shown that losses may be sustained at any stage in the life of the plant, and further that the size of the bulbs is considerably lessened by the disease. Field observations indicated that the development of the mildew is favoured by abundant moisture and relatively low temperatures. Commercially grown onions were found to be attacked as early and as frequently on new as on old onion land, the first diseased plants being fairly evenly scattered throughout the fields. There was evidence that the mycelium of the fungus in the onion seed is an important source of primary infection of the ensuing crop.

In the laboratory the fungus fruited over a wide range of temperatures, water on the leaves being a necessary condition for the formation of the conidial fructifications. The spores germinated best in lake water and within temperatures ranging from 3° to 27° C., with an optimum at 11°. The incubation period in the host was about 11 to 15 days.

Control of the disease by spraying or dusting is not considered to be practicable, but the losses caused by it may be minimized by the prevention of the spread of the fungus to new areas, by strict sanitation of the fields, and by regulation of environmental conditions.

Flachs (K.). **Salatfäule.** [Lettuce rot.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 11, pp. 261–264, 2 figs., 1933.

A popular account is given of the lettuce rots caused by *Sclerotinia minor* and *S. sclerotiorum*, of which the former is the more important in Germany [*R.A.M.*, xi, p. 492], affecting both forcing and outdoor plants, frequently to the extent of 50 or 70 per cent. In addition to soil treatment with formalin (2 to 3 per cent.) as previously recommended, the writer advises the application to the beds, some 14 days before planting out, of 0·5 per cent. formalin or 0·25 per cent. uspulun, and the sprinkling of uspulun dust round the seedlings.

Dijkstra (G. K.). **Proeven ter bestrijding van Cladosporium cucumerinum Ell. et Arth. in bakkomkommers.** [Experiments in the control of *Cladosporium cucumerinum* Ell. et Arth. in hotbed Cucumbers.]—*Tijdschr. over Plantenziekten*, xxxix, 2, pp. 21–37, 2 pl., 1933. [English summary.]

Full details are given of the writer's experiments, carried out in the glasshouse district of Naaldwijk, Holland, in 1931, in the control of cucumber fruit blight (*Cladosporium cucumerinum*) [*R.A.M.*, xi, p. 690]. The best method of maintaining the constant high soil temperature (26° to 29° C.) necessary to check the disease is by means of hot water pipes, but since artificial heating is not always practicable, an attempt was made to secure similar effects by liberal applications of horse dung. The latter procedure was found to be ineffectual in raising the soil temperature to any extent, and cannot be relied upon to prevent primary infection from the soil, which was shown by inoculation experiments to take place. It did, however, increase the yield and accelerate the maturity of the crop.

C. cucumerinum may be controlled by treatment of the soil with 0·4 per cent. commercial formalin or 0·5 per cent. uspulun at the rate of 10 to 15 and 7 to 10 l. per 1·2 sq. m., respectively; the latter preparation, however, is apt to exert an adverse effect on plant growth.

Sella (M.). **Il tartufo bianco in Istria.** [The white truffle in Istria.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxix, 2, pp. 155–164, 4 figs., 1932.

In this note the author describes the discovery in Istria of white truffles (*Tuber magnatum* Pico) of the same high culinary qualities as those that exist in Piedmont, and in quantities suggesting that their production may be profitably exploited. The areas of their occurrence, almost confined to the calcareous alluvial soils of the so-called 'white Istria', are indicated, and it is stated that the truffles are most commonly found in association with poplar,

willow, *Quercus robur*, juniper, and in the neighbourhood of *Abies pectinata*, but also in open meadows. Besides *T. magnatum*, Istria produces two other truffles of lesser economic value, namely, *T. borchii* and *T. brumale* [*R.A.M.*, xii, p. 198], and it is thought probable that *T. melanosporum* may also be found eventually to exist there.

Lohwag (H.). **Über Trüffelvorkommen.** [On the occurrence of truffles.]—*Verh. Zool.-Bot. Gesellsch. Wien*, lxxxii, 1–4, pp. 117–123, 1932.

Attention is drawn to the occurrence of summer truffles (*Tuber aestivum*) [*R.A.M.*, xii, p. 198], a valued delicacy of the Vienna market, in certain fir woods of Lower Austria (Neunkirchen and St. Egyd), where their presence below the soil is indicated by the development, on the corresponding above-ground areas, of hay-coloured 'fairy rings' of *Festuca rubra*. Outside the circles, and strongly contrasting with the latter in their vivid green colour, grew *Poa pratensis* and a number of other plants not belonging to the Gramineae [a list of which is given]. Once the circle indicating the presence of the truffles is recognized, the position of the latter can be determined by the unevenness and cracking of the soil over the buried fungus. The truffle gatherers are expert at finding them from these surface indications.

Veresciaghin (B. V.). Вредители Виноградной лозы и борьба съ ними. (По наблюденіямъ въ Бессарабіи за **20** лѣть **1913–1932**). [Agencies injurious to the Vine and their control (according to observations in Bessarabia from 1913 to 1932).] —16 pp., 1 fig. [on the cover], Cooperativa Agricolă 'Pomona', Chişinău [Kishineff, Bessarabia], 1933.

In this paper the author gives brief notes on the more important pests and diseases of the vine which were observed by him since 1913 in Bessarabia, among which the following may be mentioned. Although the 'esca' disease (*Stereum necator*) [*R.A.M.*, x, p. 221] was first recorded in 1927, it is believed to be of much longer standing in Bessarabia; it is especially prevalent in droughty seasons, such as that of 1930, and appears to be closely related with court-noué. White rot of grapes caused by *Charrinia* [*Coniothyrium*] *diplodiella* [ibid., xii, p. 8] is most serious in hot summers and usually develops after hail injury to the vines, when it may destroy as much as 30 per cent. of the crop. Black rot is caused locally by *Guignardia* [*Physalospora*] *baccae* [ibid., ix, p. 12] and is of minor importance; *G. bidwellii* has not yet been recorded in Bessarabia. Excoriosis (*Phoma flaccida*) [ibid., xii, p. 352] is only serious in certain years, e.g., in 1926, when in some localities up to 30 per cent. of the new growth was affected with it. *Sordaria uvicola* [ibid., x, p. 77] attacks chiefly mature grapes, which it dries up to a condition resembling that of raisins; it only causes minor losses. *Diplodia viticola* [cf. ibid., viii, p. 11] is frequently found on dying vine twigs, but is considered to be rather a saprophyte than a parasite. *Alternaria vitis* [ibid., ix, p. 12] is a very widespread saprophyte, usually following an attack by some primary parasitic fungus on the leaves, twigs, and grapes.

Trichothecium candidum [ibid., vii, p. 326] was for the first time observed in 1932 attacking the grapes of certain American self-rooted varieties, on which it formed irregular pinkish spots, and frequently caused the drying-up of whole bunches. [A note on *T. candidum* on grapes is also published, in the Rumanian language, in *Revista Horticola*, Chişinău, No. 118, pp. 159–160, 1932.]

Chabrolin [C.]. **Le rougeau de la Vigne.** [Rougeau disease of the Vine.]—8 pp., 1 graph, [1933].

The disease known as 'rougeau' or 'rougeat' [*R.A.M.*, x, p. 221; xii, p. 200] on red, and as 'flavescence' on white, grape vine varieties was very prevalent in Tunis in 1932, where it appeared towards the end of July and the beginning of August. The leaves turned red at the edges and rapidly withered and fell, the berries therefore ripening under unsatisfactory conditions. When the autumn rains set in new green shoots were put out, but branches that had been badly affected fell a ready prey to various fungi, including *Sphaeropsis malorum* [*Physalospora cydoniae*]. The disease occurred in patches on low, damp areas and occasionally on hillsides, vines trained on wires and bearing a heavy crop suffering most. The most susceptible varieties were Petit-Bouschet, Alicante-Bouschet, Carignan, and, occasionally Clairette; Alicante-Grenache was remarkably resistant.

The winter had been exceptionally wet, and when growth began the rootlets were badly developed and in a waterlogged and insufficiently aerated subsoil. March, April, and May were very dry, so that the top layers of the soil dried up and the rootlets in them died. The unbalanced accumulation of carbohydrates in the leaves due to the loss of roots resulted in the development of the conditions shown by Ravaz [ibid., iii, p. 505] to lead to rougeau. The root system became unable to provide the leaves with sufficient water, and this (not the rougeau itself) led to desiccation and dropping. Deprived of their leaves, the vines lived on their reserves, which were insufficient to enable the berries to ripen normally.

Affected vines should be pruned well back early in the season, but no attempt should be made to stimulate a normal yield. The old wood should be cut away to benefit the suckers. Vines on which many branches have died should be generously sprayed immediately after pruning with a 30 or 40 per cent. solution of iron sulphate or 3 per cent. Bordeaux mixture. The subsoil should be aerated and the vines well manured, preferably with potassium fertilizers.

Wormald (H.) & Harris (R. V.). **Notes on plant diseases in 1932.**—*Gard. Chron.*, xciii, 2412, pp. 192–193; 2413, p. 213; 2414, pp. 228–229, 1933.

The following information, in addition to that already noticed from other sources, is given on plant diseases investigated at the East Malling Research Station, Kent, during 1932 [cf. *R.A.M.*, xi, p. 21].

Under such conditions as those prevailing in 1932, two pre-blossom sprays are essential for the control of apple scab (*Venturia*

inaequalis) [ibid., xii. p. 297]. Infection had already become established at the 'pink-bud' stage. Many spurs of Louise Bonne of Jersey pear trees on a north Kent farm bore withered leaves and flowers; the cracks in the bark were found to contain scab (*V. pirina*) pustules. Infection had evidently taken place in 1931 [cf. ibid., xi, p. 659].

Cherry, plum, and apple trees suffered heavy damage from the blossom wilt fungus (*Sclerotinia cinerea*), the Lord Derby apple variety being particularly susceptible and bearing practically no fruit in some eastern and south-eastern orchards [ibid., xii, p. 99].

Verticillium dahliae [ibid., xii, p. 76] was found in the tissues of wilting lupins, in diseased black currant branches, and in quince layers, the last named being apparently a new host. The fungus was further isolated from the discoloured tissues of young pear trees grafted on quince stocks. Leaf blotch of quince (*S. cydoniae*) [ibid., xi, p. 93] caused heavy infection at East Malling, wilting of the young shoots being observed in a number of cases.

Sooty blotch (*Gloeodes pomigena*) [ibid., xii, p. 298, and below, p. 517] was unusually prominent in 1932 on apples, pears, and plums (Warwickshire Drooper, Victoria, and Pond's Seedling).

Extensive mosaic infection was responsible for the failure of a number of Lloyd George raspberry plantations [ibid., x, p. 530], a matter of considerable importance in view of the very heavy demand for this variety for canning. Excellent yields, on the other hand, have been obtained from a series of experimental nurseries on selected Kent and Sussex farms specifically designed for the raising of virus-free canes.

Labrousse (F.). **Notes de pathologie végétale.** [Notes on plant pathology.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 2, pp. 71–84, 1933.

In April, 1932, the author isolated *Bacterium solanacearum* from wilted tomatoes grown near Casablanca, Morocco [*R.A.M.*, xi, p. 808]. Inoculations with this strain gave positive results on twenty tomato varieties, *Datura stramonium*, Belle de Fontenay potatoes, *Solanum texanum* [*S. integrifolium*], and *Impatiens balsamina*, but were negative on some twenty other plants known to be susceptible to *Bact. solanacearum*, including five varieties of tobacco, two of *Nicotiana rustica*, *Capsicum annuum*, *Physalis alkekengi*, and *Petunia violacea*.

When 55 spinach varieties were grown in soil artificially contaminated with *Pythium ultimum* [ibid., xi, p. 344] some individual plants alone showed resistance.

Strawberries were affected by three types of dying-off: a leaf roll common on large-fruited, hybrid varieties, especially Madame Moutot, and causing partial or complete shedding of the fruit; a 'frisolée' (crumpled) condition of the leaves characterized by light green, somewhat shrivelled patches with excessive flowering and premature fruit shedding (the Belle de Meaux variety was particularly susceptible to this form); and a dwarfing (noted only on Gaillon plants from Vaucluse) consisting in a progressive and finally very marked stunting of the aerial and subterranean organs, which, however, remained otherwise normal; in very

severe cases the leaves of these dwarfs did not exceed 2 to 3 mm. in length. No organism was associated with any of the conditions, which, from the evidence obtained, appeared to be non-transmissible. They are regarded as physiological in origin and probably due to unsuitable soil and manuring.

In June, 1932, apparently perfectly healthy strawberry plants of a variety resembling Vicomtesse Héricart growing at Baignes (Charente) and bearing numerous well-developed fruits suddenly withered completely. The main roots were almost entirely disorganized and showed the presence of various fungi including *Rhizoctonia* [*Corticium*] *solani* and a *Pythium*.

Collar rot of peas due to separate or combined attacks of *Thielaviopsis basicola* and *Aphanomyces euteiches* [ibid., xi, p. 623] caused heavy losses in one locality in the Seine-et-Oise, the plants withering and dying shortly before being picked. *Bact.* [*Pseudomonas*] *pisi* was obtained from Welcome peas at Sarcelles showing violet-brown spots surrounded by a translucent halo on the pods, leaves, and stalks; the plants died before the pods were fully developed. Inoculations with the bacteria gave positive results on several varieties.

In August, 1932, ring spot [ibid., xi, p. 94] and a form of canker or anthracnose consisting of oblong, depressed, yellowish, later brownish spots on the veins and stalk, were observed on tobacco in the Bas-Rhin, especially on the Rhino-Burley and Cabaud varieties, both diseases usually being present on the same plant. Plants badly attacked by both conditions showed general characteristics closely resembling those of potato streak, including, in particular, marked brittleness. Examination of diseased material obtained in Alsace in 1930 and 1931 failed to show the presence of any pathogenic organism, but inoculations made with the juice from plants showing either of the conditions gave rise to symptoms identical with those seen in nature. Near the points of inoculation pale yellow, circular, sterile spots appeared, while the leaves and young stalks developed necrotic lesions which quickly turned to typical cankers. Typical ring spot appeared on young leaves that subsequently developed. Both conditions are thus to be regarded as manifestations of a single virus disease.

From a heart rot of pineapple buds (Smooth Cayenne and Bouteille varieties) from Guadeloupe the author isolated a strain of *Phytophthora parasitica* var. *microspora* [ibid., vii, p. 602], inoculations with which reproduced the condition on the same varieties but not on Red Spanish pineapples.

Ducomet [V.] & Foëx [E.]. **Quelques maladies des plantes cultivées en 1931–1932.** [Some diseases of cultivated plants in 1931–1932.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 2, pp. 55–66, 1933.

In the autumn of 1931 self-sown wheat at Versailles first showed infection by *Puccinia graminis* on 1st November, and by *P. triticina* on 5th November. Owing to an exceptionally mild early winter *P. glumarum* was still present on 15th February following. Inoculations of autumn-sown Noé wheat with *P. glumarum* on 20th November and 5th December 1931 gave rise to pustule

formation on the following 30th December and 6th January, respectively. Ten stools of Noé wheat inoculated with *P. glumarum* on 29th November, 1931 showed a few pustules on 6th January following, 10·7 per cent. infection on 18th January, and 17·5 per cent. infection on 8th February. From 6th to 18th January, 1932 the minimum daily temperature averaged 3° C. and only twice fell below 0°, while the maximum averaged 10°. Between 10th and 15th February severe frosts destroyed the pustules of *P. glumarum* and the leaves bearing them, no further pustules being noted until 14th March, when a few were found on the new shoots in one of the January centres of infection. Wheat sown on 7th October showed the first pustules of *P. glumarum* on 2nd April, infection becoming general on 15th May; the corresponding dates for *P. triticina* were 6th and 27th June. Wheat sown on 15th December showed the first pustules of *P. glumarum* on 17th April, infection becoming general on 20th May; the corresponding dates for infection of this sowing by *P. triticina* were 22nd and 27th June. The spring sowing, effected on 5th March, showed the first infection by *P. glumarum* on 27th April and general infection on 25th May, the corresponding dates for *P. triticina* being 27th June and 15th July. *P. graminis* appeared on wheat at the end of June, 1932, the sowing made on 5th March being that most severely infected. The last-named fungus seriously affected wheat in the vicinity of Dijon, especially the late, heavy-yielding varieties, though P.L M. I. was relatively unaffected; it also (owing to an exceptionally wet spring and early summer) caused intense infection of cereals in the Bas-Dauphiné and Provence, and in some instances almost entirely destroyed the crops.

Late blight of potatoes (*Phytophthora infestans*), though present in the Seine-et-Oise in June 1932, was subsequently negligible; rain fell in July, but the minimum daily temperature was generally below 10°, and August was marked by drought. Serious losses were, however, caused in Brittany, parts of eastern France, and in the south-west. In Alsace and the Rhone valley early varieties suffered severely, but on others infection was arrested in August as a result of drought. In some localities, such as the mountainous parts of Forez (Loire) the disease persisted throughout August owing to night dews.

At Russ-Hersbach (Bas-Rhin) potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, x, p. 816] was favoured by hot weather in July, 1932, but was later arrested by drought. Slight spread occurred in the valley of the Bruche, and two new centres of infection were noted at Brumath. Infection was also present in the Vosges mountains, but outside the Bruche valley the areas affected were very limited. The Collin des Vosges and Flucke varieties were resistant.

Following cool, wet weather, tobacco wildfire (*Bacterium tabacum*) [ibid., xi, p. 807] developed in certain parts of south-western France in the spring of 1932. In very wet localities it was present in May and July but was temporarily arrested in June and August; the attacks were resumed in September, apparently owing to mists. In the vicinity of Grenoble the disease appeared late and was unimportant. In the low-lying parts of

Alsace a widespread attack occurred about 25th June and was fairly severe by the end of July, when the middle leaves were affected. In the south of France the first attacks occurred in September. Disinfection of the seed-beds with mixtures containing copper gave good results. There was no evidence of seed transmission.

PERRET (C.). **Les maladies des plantes observées en 1932 dans le département de la Loire et particulièrement dans le Haut-Forez.** [Diseases of plants observed in 1932 in the department of the Loire and particularly in Haut-Forez.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 2, pp. 67–70, 1933.

Since 1928, beans growing in the neighbourhood of the Loire have been affected by an apparently seed-borne disease which causes them to wither before flowering; dwarf beans [*Phaseolus vulgaris*] are more susceptible than runner [*P. multiflorus*] varieties.

Owing, in the author's opinion, to over-production the year before, potatoes growing at Merle (Loire) in 1932 were severely attacked by leaf roll [*R.A.M.*, xi, pp. 23, 261]. Late blight [*Phytophthora infestans*: ibid., vii, p. 390] appeared in the same locality (860 m. above sea level) on 30th July, when flowering had scarcely begun, and by 5th September it had destroyed the plantations of susceptible varieties. Infection did not spread concentrically, but progressed steadily. Much of the crop growing at about 350 m. had been destroyed by 20th July. Spread was retarded but not arrested by extremely hot, dry, cloudless weather from 4th to 25th August. In one plot where all the leaves were present on 30th July, 40 per cent. were destroyed by 25th August, and they were all dead by 5th September. Between the two last-named dates the weather was wet with one day of mist. Heavy applications of copper dusts made early in August gave better results than copper solutions, but did not affect the number of affected tubers. In the Loire considerable losses from this disease have been sustained for three years in succession; in 1932 the crop from susceptible varieties grown in the vicinity of Haut-Forez was reduced by 50 per cent.

RIVERA (V.). **Rilievi fitopatologici fatti nelle annate 1930–32 al Laboratorio ed Osservatorio di Patologia Vegetale del R. Istituto Superiore Agrario di Perugia.** [Phytopathological records made during the years 1930–32 at the Laboratory and Observatory of Plant Pathology of the Royal Higher Agricultural Institute of Perugia.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 1–13, 1933.

Most of the items of phytopathological interest dealt with in this report have already been noticed from other sources [cf. *R.A.M.*, xi, p. 692; xii, p. 82] or are included in separate articles in the present issue [see next abstract and below, pp. 497, 498, 521].

CORNELI (E.). **Mal del mosaico su Patate. Ruggine su Grano in autunno. Mal del piombo su Peschi.** [Mosaic disease of Potatoes. Rust of Wheat in autumn. Silver leaf of Peaches.] —*Riv. Pat. Veg.*, xxiii, 1–2, pp. 51–52, 1933.

Potato plants growing in damp localities in the plains near

Perugia became seriously attacked by mosaic in May 1931 and 1932. The aerial growth and the affected leaves were dwarfed, and while few of the plants were killed, the resultant tubers were scanty and small. The attacks, which were sporadic and apparently insect-borne, were not followed by any further extension in either year.

In November, 1932, wheat sown in August and September 800 m. above sea level at Bologna was severely attacked by *Puccinia graminis* [see below, p. 498], the attack, probably owing to heavy rain and marked fluctuations in temperature, reaching epidemic proportions. Perfectly developed uredospores and teleutospores were found on the leaves.

In the autumn of 1932 peach trees at Foligno were attacked by silver leaf disease [*R.A.M.*, vi, p. 395], which caused premature leaf fall.

VILKAITIS (V.). **Naudingųjų augalų ligos ir tų ligų bei kovai su jomis priemonių tyrimas 1927–1932 metais.** [A survey of the work done at the Plant Protection Station from 1927 to 1932.]—*Augalų Apsaugos Stoties 1927–1932 m. darbų apyskaita*, Žemės Ukio Tyrimo Įstaigos Darbai, Kaunas, pp. 7–55, 5 figs., 3 graphs, 1933. [German summary.]

In this paper the author gives an account of the activities of the Dotnuva [Lithuania] Plant Protection Station since its creation in 1927. The bulk of the work has been directed towards the study of the biology of the wheat bunt fungus (*Tilletia tritici*) [*T. caries*] and of its control. It was shown that wheat seed-grain infected with bunt spores that had been subjected to dry heat for one hour at 89° to 90·5° C. produced as many bunted plants as were obtained from seed infected with spores which had been treated for the same length of time at 79° to 81°. Both treatments, however, slightly reduced the incidence of bunt in the ensuing crops, as compared with that produced by seed infected with spores which were not heated. Freezing the spores for 10 hours at −27° C. had no effect on their viability; nor was their viability adversely affected when bunted wheat ears were left in the field throughout the winter, entailing exposure to prolonged frosts as low as −28°. Bunt control experiments showed that disinfection of the seed-grain by steeping is more effective under local conditions than the dry or short disinfection processes, and that the last-named is less effective than dusting the seed with fungicides. It is mentioned that in 1932, presumably owing to the very rainy weather which prevailed during harvest time, the germinability of the wheat seed-grain was very adversely affected by all the disinfectants tested. Three years' tests showed that line no. 2524, locally isolated from Blé rouge de St. Laud (*Triticum vulgare* [var.] *erythrospermum*), was outstanding in its resistance to bunt.

Among the other diseases of cultivated plants briefly dealt with mention may be made of a species of *Fusarium* closely resembling *F. herbarum* [*R.A.M.*, x, p. 513], and having mostly six-celled spores, measuring on the average 50 to 56 by 3·6 μ, which was repeatedly isolated from Lithuanian flax seed; the germinability

of surface-disinfected flax seed which was inoculated with this fungus was either considerably reduced or completely inhibited, and the seedlings raised from such seed showed symptoms of a root disease or were very much retarded in their growth. The flax wilt fungus, *F. lini*, appears to be of rare occurrence in Lithuania.

Attempts to control the finger-and-toe disease of cabbage (*Plasmodiophora brassicae*) by applications of uspulun-universal, germisan, slaked lime, or of a 10 per cent. soda solution were only partially successful on artificially inoculated soil and only in the first year, but failed to give any improvement on soils infected for longer periods. The reaction of soils in which the disease had existed for many years and in which from 60 to 93 per cent. of the cabbages were affected, was found to be P_H 7·6 ; the lowest P_H value at which finger-and-toe diseased plants were found was 4·1.

Miller (P. R.), Stevens (N. E.), & Wood (Jessie I.). **Diseases of plants in the United States in 1931.**—*Plant Disease Reporter, Supplement* 84, 65 pp., 13 graphs, 10 maps, 1933. [Mimeographed.]

This report, prepared on the usual lines [*R.A.M.*, xi, p. 770], contains much useful information on the incidence of disease among cereal, forage, and vegetable crops, tobacco, cotton, trees, ornamentals, and fruits and nuts. A map shows the distribution of blister rust (*Cronartium ribicola*) and the range of white or 5-needled pines [*Pinus* spp.] in North America [see above, p. 480].

Osmun (A. V.). **Department of Botany.**—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the fiscal year ending November 30, 1932* (*Bull.* 293), pp. 15–21, 1933.

The following items of phytopathological interest occur in this report, to which W. L. Doran and E. F. Guba contribute. Tobacco was grown for the tenth successive year in plots last limed in 1923. In 1932 no black root rot (*Thielavia* [*Thielaviopsis*] *basicola*) developed in unlimed plots with a hydrogen-ion concentration of P_H 5·2, but the disease was fairly severe in adjacent limed plots at P_H 5·9 [*R.A.M.*, xi, p. 496]. The average yields per acre were 1,906 lb. in unlimed and 1,559 lb. (18 per cent. less) in limed plots. The persistence of the effects of lime on the incidence of black root rot and the tobacco yield is illustrated by the following figures for crop reductions in the treated plots : 1924, 10 per cent. ; 1925, 45 ; 1926, 43 ; 1927, 35 ; 1929, 23 ; 1930, 25 ; and 1931, 16. In pot tests infection by *T. basicola* was greatly reduced or prevented by the application to the soil of ammonium thiocyanate at the rate of 900 lb. per acre ; at the same time, however, this compound exerted a toxic effect on the tobacco for some 18 weeks after treatment. Brown root rot of tobacco [loc. cit.] was usually more severe in clay than in sandy soils following timothy [*Phleum pratense*] in the cropping system. The addition of timothy to sandy soils was sometimes beneficial to the ensuing tobacco crop.

Peronoplasmopara [*Pseudoperonospora*] *cubensis*, the causal organism of downy mildew of cucumbers [ibid., xii, p. 5], was well controlled by spraying with a resin solution (1 in 150 or 1 in 200),

the stock solution being made up of 5 parts each of resin and wood alcohol and 1 of potassium hydroxide.

Downy mildew of lettuce (*Bremia lactucae*) [ibid., xii, p. 417] occurred in a severe form on the previously resistant Bel-May variety; the following percentages of infection were shown by the other varieties tested: Dreer's Wonderful 25, Sutton's Golden Ball 24, Rosy Spring 3, Dreer's Iceberg 1, and Loos Tennis Ball 0. Sporulation in *B. lactucae* was entirely suppressed by dusting infected plants with sulphur dust, while copper-lime-arsenic dust was almost as effective.

The causal organism of eggplant wilt (*Verticillium*) [*albo-atrum*: ibid., xi, p. 626] was found to grow at a range of 50° to 95° F., with an optimum at 78°. The host grew best at a soil temperature range of 77° to 95°, the maximum infection developing at the former point and none at the latter or at 55·4°. The results of field applications of aluminium sulphate and sulphur were not such as to justify the extended use of these compounds, the best means of wilt control evidently lying in cultivation on naturally acid sod land.

The gold leaf disease of strawberries [ibid., xi, p. 496] is associated with chlorophyll degeneration, resulting in poor growth and often in death. Seedlings of Howard 17 develop the typical symptoms of this disorder, which may be avoided by adherence to asexual propagation from the original clone of this variety.

A list (compiled by O. C. Boyd and W. H. Davis) is given of the plant diseases of outstanding importance affecting Massachusetts crops in 1932.

In the report of the Department of Olericulture (pp. 43–45), G. B. Snyder and R. W. Donaldson state that the disorder of swedes known as dark centre or internal breakdown is definitely correlated with a low soil moisture content. Brownish or water-soaked areas develop in the parenchyma tissue between the vascular strands, and in the advanced stages of the disturbance the affected tissue becomes pithy and woody.

Diseases, insects, and other pests injurious to plants.—ex *Sixth Bienn. Rept. Kansas Agric. Exper. Stat. for the biennium July 1, 1930, to June 30, 1932*, pp. 85–100, 1932. [Received May, 1933.]

Notes are given on the progress of plant disease investigations in Kansas during the period from 1st July, 1930, to 30th June, 1932. Most of the information has already been noticed in this *Review* from other sources.

Tisdale (W. B.). **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1932*, pp. 128–148, 1932. [Received June, 1933.]

Further work by A. S. Rhoads on the control of citrus gummosis and psorosis indicated that both diseases are amenable to treatment by the bark-scraping method in the early to intermediate stages [*R.A.M.*, xi, p. 770], this operation being practically useless, however, at a more advanced phase when the underlying bark is already affected and discoloured.

The causal organism of citrus melanose (*Phomopsis citri*) was found by G. D. Ruehle and W. A. Kuntz to be carried over on dead wood into the second spring, though with a progressive reduction of the infection from such wood in the second year. The excision of all dead wood from several heavily infected eight-year-old trees during the winter, however, failed to give commercial control. So far the ascospore isolations of *Diaporthe citri* have only produced the *Phomopsis* stage, whereas another species of *Diaporthe* found on other hosts as well as on citrus gives ascosporal fructifications in culture. During the summer pure cultures of *P. citri* were secured from the buttons of immature citrus fruits, indicating early field infection which is carried over in the button until the fruit is placed in transit or storage. None of the chemical treatments hitherto tested has given as good control of stem-end rot in storage as the removal of the buttons.

Promising results in the control of citrus scab [*Sporotrichum citri*] have been given in a limited number of tests by the application of Bordeaux mixture [ibid., xii, p. 166].

The stems, petioles, peduncles, and fruits of tomato were attacked by *Alternaria solani* [ibid., xii, p. 249], this being apparently the first record of the fungus on the fruits. The spots produced by *A. solani* differ from those due to the 'nail-head' organism [*A. tomato*: ibid., xi, p. 771].

Outstanding resistance to *Fusarium* wilt [*F. niveum*] has been shown in M. N. Walker's experiments by certain selections of Watson, Wonder, Iowa Belle, Iowa King, Pride of Muscatine, and the Iowa hybrids and crosses between some of these watermelon selections [ibid., xii, p. 423].

A. N. Brooks and R. E. Nolen found that strawberry roots, rhizomes, crowns, and fruits are liable to infection by *Sclerotium rolfsii* [ibid., iii, p. 381]. *Colletotrichum fragariae*, the agent of anthracnose of strawberry runners [ibid., x, p. 805], was found to be also responsible for a wilting of the plants and rot of the rhizomes. Inoculation experiments showed that the incubation period for the fungus ranges from a few days in hot weather to several weeks under cooler conditions. The application of 4–4–50 Bordeaux mixture has given good control of the anthracnose phase of the disease.

In a collection of 25 maize varieties planted by R. K. Voorhees on five dates between 4th February and 4th April, the latest planting showed the highest percentage of brown spot (*Physoderma zeae-maydis*) [ibid., xii, p. 431].

WEDGWORTH (H. H.). **Studies relative to plant pathology problems in the Everglades.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1932*, pp. 128–148, 1932. [Received June, 1933.]

Phytopathological investigations in the Everglades region of Florida during the period under review were largely concerned with the field control of powdery mildew [*Erysiphe polygoni*] of beans [*Phaseolus vulgaris*: *R.A.M.*, xi, p. 346], early blight and bacterial spot of celery [*Cercospora apii* and *Bacterium apii*: ibid., x, p. 220; xi, p. 761], early and late blight of potatoes [*Alternaria*

solani and *Phytophthora infestans*], leaf blight of carrots (*Macrosporium carotae*) [ibid., x, p. 436], and pepper [*Capsicum annuum*] blight (*P. capsici*) [ibid., xii, p. 112]. Work was also conducted in connexion with the certification of potato seed against virus diseases. Very effective control of the yellowing of beans in alkaline soils (above P_H 6) was obtained by spraying the plants with 0·25 to 1 per cent. solutions of manganese sulphate, four applications being given at ten-day intervals.

GHEORGHIU (I.). **L'immunité et la vaccinothérapie anticancéreuse chez les plantes.** [Immunity and anti-cancerous vaccinotherapy in plants.]—*Comptes rendus Soc. de Biol.*, cix, 15, pp. 1387–1389, 1932.

In order to ascertain the possibilities of conferring immunity from infection by *B*[*acterium*] *tumefaciens*, and consequently from crown gall, on *Pelargonium zonale* [*R.A.M.*, xii, p. 148], the writer injected into the stems of several plants large quantities of an emulsion of young agar cultures of the organism heated to complete inactivation at 60° C. Thirty to forty days later the same plants were inoculated with a virulent culture of *Bact. tumefaciens* and kept under observation for ten months, during which period no tumours developed. Check plants similarly inoculated without previous protective injections contracted the typical crown gall symptoms in the usual time.

With a view to testing the efficacy of the injection treatment in plants already infected with crown gall, the writer gave seven or eight applications of the inactivated emulsion of *Bact. tumefaciens*, at five- to six-day intervals, four to six months after inoculation; in some plants the emulsion was applied to the exposed subepidermal tissues on plugs of cotton-wool, while in others six to eight injections were given at five-day intervals with a fine needle in various parts of the plants, including the actual tumours. Immediately following the operation the tumours began to shrivel and eventually disappeared completely, with the result that the plants resumed normal growth and showed no sign of any interference with their normal biological processes. The control plants inoculated at the same time with the crown gall organism developed tumours, lost their chlorophyll, withered, and ultimately died. It is claimed, therefore, that the occurrence of crown gall in *P. zonale* can be not only prevented but cured by appropriate vaccinotherapy.

NEILL (J. C.). **Wheat diseases in New Zealand. Notes on their incidence and control.**—*New Zealand Journ. of Agric.*, xlvi, 3, pp. 137–140, 1 fig., 1933.

Brief, popular notes are given on the symptoms, incidence, and control of the following wheat diseases in New Zealand [cf. *R.A.M.*, vii, p. 224; xi, p. 32]; leaf [brown] rust [*Puccinia triticina*], stem [black] rust [*P. graminis*], loose smut [*Ustilago tritici*], stinking smut [*Tilletia caries* and *T. foetens*], mildew [*Erysiphe graminis*], take-all [*Ophiobolus graminis*], and scab [*Gibberella saubinetii*]. Under New Zealand conditions College Hunter's wheat is apparently immune from loose smut, and Solid Straw Tuscan rarely

shows more than a trace of infection. It is stated that most of the large seed-cleaning plants have now installed dusting machines for the control of stinking smut, so that the seed-grain may be obtained ready dusted.

Corneli (E.). **Rilievi sullo sviluppo delle ruggini sul Frumento.** [Notes on the development of rusts on Wheat.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 17–25, 1933.

In 1929 the first outbreak of *Puccinia triticina* (on Gentil rosso wheat) near Perugia [*R.A.M.*, viii, p. 761] occurred on 1st June, whereas in the two following years the first attacks (on Mentana wheat) were on 9th and 8th May, respectively. Each year *P. graminis* appeared a few days after *P. triticina*, its attack rapidly assuming epidemic proportions, though the spread of the latter fungus became arrested. The delay in the onset of the rusts in 1929 is attributed to retardation in the growth of the wheat due to a late winter and a cool spring. On 6th June, 1929, *P. graminis* attacked a strip of Mentana wheat on either side of which Gentil rosso wheat was at that date unaffected. Mentana being an early variety, and more resistant than Gentil rosso, its greater susceptibility is attributed to the stage of growth reached.

The influence of high temperature and moisture in predisposing wheat to rust is clearly brought out by a study of the local climatic conditions during June, 1929. The average daily temperature was unusually high (22·5° C.) and at first fluctuated considerably; on the 6th it was only 13·5°, but on the 9th it rose to 25·5°. A succession of very hot days followed, when the daily temperature averaged 22° to 26°; light showers fell on the 2nd and 6th, and rain on the 13th, after four fine, hot days when the temperature averaged 24·5° to 26°; finally, the hot, moist conditions became more accentuated, culminating in almost constant rain during the last ten days. On 12th June (the day preceding the first wet one) only very faint traces of infection were present on only a few varieties, but on the 19th, i.e., exactly at the termination of the incubation period (six days) as determined experimentally, very severe infection by *P. graminis* occurred on all the varieties at the experiment station. Wheat growing on the hills was less severely affected than that in the plains where dew and moisture persist longer, and wheat in fields facing east or south-east, so as to receive the rays of the sun in the morning, was less affected than elsewhere.

In the spring of 1930, a limited but marked infection by *Aecidium berberidis* was noted on a clump of *Berberis vulgaris* growing near a place where wheat is threshed annually; no infection was present, however, in the two preceding years or that following. The author's attempts to germinate the teleutospores of *P. graminis* have all failed, and it is believed that their germination is altogether exceptional in Italy.

In Italy the uredospores of *P. graminis* overwinter on wild hosts on which they are able to withstand a temperature of −15°, though an exposure to this temperature for about 15 hours was found greatly to reduce the percentage germination [see next abstract].

Bruschetti (C.). **Sulla capacità germinativa delle uredospore di ruggini del Grano.** [On the germinative capacity of the uredospores of Wheat rusts.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 33–36, 1933.

After citing two instances of the infection of wheat by rust [*Puccinia* spp.] during winter in Italy, in one of which Carosello wheat sown in September bore perfectly normal uredospore pustules on 26th December, 1932, and 9th January, 1933, after hard frosts and a period of severe cold, while in the other Romanello wheat sown in August and September at Bologna about 800 m. above sea level was subsequently killed off by rust, the author states that the leaves of *Festuca elatior* after being covered with a layer of ice for several days showed perfectly preserved rust sori bearing uredospores which later gave a high percentage of germination. Uredospores of *P. graminis* kept in hanging drop cultures for 24 hours at −3° C. and then removed to 23° in a thermostat, after 12 hours gave 63 per cent. germination.

Portions of the culms of Carosello wheat bearing rust pustules, and uredospores from the same material in hanging drop cultures, were kept at −15° for about 15 hours and then removed to a temperature at which germination normally occurs. The hanging drop cultures failed to germinate, whereas the uredospores on the host gave about 30 per cent. germination, as compared with 70 to 80 per cent. germination in the case of the controls kept at laboratory temperature (15°). The germinative power of the uredospores remained unimpaired after they had been kept over 45 days in the laboratory.

These results are considered to go far towards explaining the overwintering of the cereal rusts in the region of Perugia.

Unlike what has been reported by other investigators [*R.A.M.*, viii, p. 163; xi, p. 563] light and darkness had no effect whatever on uredospore germination in the author's experiments, though rain water, as compared with distilled, increased percentage germination and accelerated the emission of the promycelial tube.

Ukkelberg (H. G.). **The rate of fall of spores in relation to the epidemiology of black stem rust.**—*Bull. Torrey Bot. Club*, lx, 3, pp. 211–228, 2 figs., 2 graphs, 1933.

A description is given of an apparatus which allowed the author to measure the relative rate of fall in still air of the uredo- and aecidiospores of the four cereal rusts *Puccinia graminis tritici*, *P. g. secalis*, *P. coronata avenae* [*P. lolii*], and *P. triticina*. Statistically significant differences were found between the respective velocities of fall [which are specified] of the spores of the four species, and between the uredo- and aecidiospores of the same species, and from the figures obtained it is calculated that the average theoretical dispersal distance of uredospores that have reached an altitude of 5,000 feet and are being carried by a 30 miles-per-hour wind is 1,000 miles for *P. triticina*, 1,100 miles for *P. g. tritici*, 1,200 miles for *P. g. secalis*, and 1,270 miles for *P. lolii*. The average theoretical dispersal distance of the aecidiospores, based on their velocity of fall, is greater than that of the uredospores.

The average velocity of fall of the uredospores of *P. g. tritici* was approximately 11·5 mm. per second, so that even in the scarcely perceptible breeze of 1 mile per hour the spores would be carried 39 times as fast as their rate of fall in still air, and upward convection currents at any velocity exceeding $\frac{1}{38}$ mile per hour would carry the spores upwards.

MAINS (E. B.). **Host specialization in the leaf rust of grasses, Puccinia rubigo-vera.**—*Papers Michigan Acad. of Science, Arts and Letters*, xvii, pp. 289–394, 1933.

Fifty-six races are recognized by the author in *Puccinia rubigo-vera* on the basis of host specialization, including the forms that have received specific names as *P. alternans, P. persistens, P. triticina, P. agrostidis, P. obliterata, P. perplexans, P. actaeae-agropyri, P. actaeae-elymi, P. aconiti-rubrae, P. dietrichiana, P. secalina, P. symphyti-bromorum, P. bromina, P. procera*, and *P. impatientis*.

In this fully tabulated and comprehensive account of the taxonomy and distribution of these rusts in North America, the author points out that the species into which *P. rubigo-vera* has been divided have mostly been based on biologic specialization, though Cunningham and Mains and Jackson [*R.A.M.*, iv, p. 213; v, p. 477] were not prepared to accept this alone as a specific character. *P. glumarum* and *P. anomala* were formerly included in *P. rubigo-vera*, but now that they are recognized as distinct species, there seems to be no reason why the latter name should not be applied to the very prevalent rust on grasses having the general type of leaf [brown] rust of wheat (*P. triticina*) [ibid., xii, p. 151], and which is divisible into a number of races usually accorded specific rank.

It has been shown in these studies that aecidia on species of *Thalictrum* are connected with uredo-teleuto-stages on *Agropyron, Bromus, Elymus, Hordeum, Hystrix*, and *Triticum*; on *Clematis* with those on the foregoing except the last named; on *Anemone* with those on *Agropyron, Elymus*, and *Hordeum* spp.; on *Delphinium* with those on *A. tenerum*; on *Ranunculus* with those on *Hordeum, Poa*, and *Puccinellia* spp.; on *Anchusa* with those on *Secale* sp.; on *Onosmodium* and *Macrocalyx* with those on *Agropyron* and *Elymus* spp.; on *Hydrophyllum* with those on *E.* and *Hystrix* spp.; and on *Impatiens* with those on *Agropyron, Elymus, Hystrix*, and *Hordeum* spp. [cf. ibid., xii, p. 273].

Lists are given of the aecidio-, uredo-, and teleutospore hosts of the races of *P. rubigo-vera*, and of the races of the latter with their synonyms and related species, and a four-page bibliography is appended.

GASSNER (G.). **Neue Wege zur Bekämpfung des Weizenflugbrandes durch Beizung.** [New methods for the control of loose smut of Wheat by steeping.]—*Phytopath. Zeitschr.*, v, 5, pp. 407–433, 1933.

A fully tabulated account is given of the writer's experiments in the control of loose smut of wheat [*Ustilago tritici*] by varying periods of immersion (up to 24 hours) in hot water (35°, 40°, or

45° C.) or by moistening the seed-grain with water of the same temperatures in closed containers at 5, 6, 7½, or 10 l. per cwt., the duration in this case being up to 14 hours [*R.A.M.*, vii, p. 155].

The efficacy of the hot-water treatment was found to be largely dependent on the exclusion of oxygen, this being a prerequisite condition for intramolecular respiration and the formation of alcohol and other cleavage products in the interior of the plant parts undergoing disinfection, to the action of which, in the author's opinion, the disinfection is partially or wholly due. On this assumption an attempt was made to improve the present technique by the addition to the water of alcohol solutions at concentrations of 2 to 5 per cent. Under these conditions it was found possible considerably to curtail the duration of the treatment, and preliminary tests indicated that by increasing the temperature to 50° still better results may be obtained in a shorter time. No diminution in the efficacy of the alcohol solutions was observed after repeated use. Besides pure ethyl alcohol, methylated spirit and isopropylalcohol proved definitely effective in reducing the period necessary for smut elimination, while promising results were also given by acetone, cyclohexanone, dioxane, methyl alcohol, glycol, glycol-monethyl ether, and glycol-monobutyl ether.

At a temperature of 45°, infection by *U. tritici* was reduced to a trace by the moistening process (six hours), while the addition of alcohol resulted in complete elimination at this heat and in a marked increase in the efficacy of the treatment at 35° and 40°.

CLARK (J. A.), QUISENBERRY (K. S.), & POWERS (LE R.). **Inheritance of bunt reaction and other characters in Hope Wheat crosses.**—*Journ. Agric. Res.*, xlvi, 5, pp. 413–425, 2 graphs, 1933.

This is an account of the results [largely presented in the form of graphs and tables] obtained by the authors in their studies in Montana of the inheritance of resistance to bunt (*Tilletia levis*) [*T. foetens*] and of other characters in crosses between the highly bunt-resistant Hope wheat [*R.A.M.*, xi, p. 705] and the three varieties, Marquis, Ceres, and Hard Federation, the relative reaction of which was shown to range, in the order indicated, from weak resistance to strong susceptibility. In the average F_3 Hope × Marquis population the tendency was towards a dominance of the stronger resistance of the Hope parent, with only 8·7 per cent. within the limits of the weak resistance of the Marquis parent; the Hope × Hard Federation cross showed a strong tendency for dominance of susceptibility, with no F_3 strain within the limits of the Hope parent, indicating the presence of several genetic factors. In the Hope × Ceres cross, the indications were of an intermediate inheritance, with a normal curve between the parents but with considerably less than one-fourth of the population within the limits of each parent. It is considered that these results indicate that the stronger the degree of resistance involved in the crosses the less complicated is the inheritance, with an increasing tendency away from an imperfect dominance of susceptibility towards an imperfect dominance of strong resistance.

In the Hope × Hard Federation cross, which was more closely

studied than the others, the percentage of bunted grains was about one-fourth of the percentage of bunted plants, with a negative correlation $r = -0{\cdot}554 \pm 0{\cdot}045$ between percentage of bunt and average yield per plant, and a positive correlation $r = 0{\cdot}501 \pm 0{\cdot}049$ between percentage of bunt and loss in yield. An increase of 5 per cent. in bunt caused a decrease of about 4 per cent. in yield.

No important relation was found between awnedness of the crosses on the one hand, and bunt or yield on the other.

Prüfungsergebnisse. [Results of tests.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst,* xiii, 3, p. 21, 1933.

The Abavit-Beiztrommel (L. Meyer, Mainz) [*R.A.M.*, x, pp. 273, 650] is now supplied in a larger make, viz., with a diameter of about 42 cm. and a height of 50 cm. The average adherence of the dust to the seed-grain (35 kg.) after ten minutes' treatment was found to amount to 86·375 per cent. (76·67 after passage through the drill) [cf. ibid., xii, p. 430]. These figures are regarded as adequate for the purpose.

Babel (A.). **Kontimix ein neuer Kurznassbeizapparat.** [Kontimix, a new apparatus for the short disinfection process.]—*Ratschläge für Haus, Garten, Feld*, viii, 3, pp. 43–47, 3 figs., 1 diag., 1933.

Technical details are given of the new Kontimix apparatus for the treatment of seed-grain by the short disinfection process [*R.A.M.*, xii, p. 430], official tests with which at Münster, Westphalia, have resulted in a favourable verdict. It is estimated that 93 to 95 per cent. of the disinfectant is normally utilized, while an average value of 87 per cent. is reached even with very small quantities and using only one instead of two or more nozzles. Up to 22 cwt. of seed-grain may be treated per hour by the Kontimix.

Simmonds (P. M.) & Sallans (B. J.). **Further studies on amputations of Wheat roots in relation to diseases of the root system.**—*Scient. Agric.*, xiii, 7, pp. 439–448, 2 figs., 3 graphs, 1933. [French summary on p. 471.]

The purpose of the work described in this paper was to determine the effect on the wheat plant of the mechanical removal at different stages in its development of certain portions of its root system, including both the seminal roots (those originating from the seed) and the crown roots (those belonging to the crown node), with the subcrown internode intervening between the two. From the pathological standpoint, the results indicated that amputations of the seminal roots and the sectioning of the subcrown internode during the seedling stage tend to delay the development of the plant, and predispose it to attacks of certain parasitic diseases of the aerial organs, such as black rust [*Puccinia graminis*]. Injuries to the seminal roots at a later stage are believed to be of lesser importance, since it is very probable that under average conditions the activity of these roots gradually decreases without any apparent ill effects. The crown root system, because of its prolific new root formation, can withstand considerable damage under conditions favourable to the plant; if, however, it becomes

the chief absorbing system, injuries to it are likely to cause prematurity of the plant, with decrease in quantity and quality of the yield.

Applying these findings to the case of wheat root diseases caused by fungi, it is pointed out that attacks by the latter may involve both the seminal and the crown root systems, as well as the subcrown internode, resulting, in all probability, in very complex reactions, ranging from almost imperceptible symptoms to complete killing of the plant, and thus rendering a critical diagnosis of the disease very difficult.

MACHACEK (J. E.) & GREANEY (F. J.). **The effect of mechanical seed injury on the development of foot rot in cereals.**—*Canadian Journ. of Res.*, viii, 3, pp. 276–281, 2 graphs, 1933.

A tabulated account is given of the writers' greenhouse and field experiments at Winnipeg, Canada, to determine the effect of mechanical injury of Marquis and Mindum wheat, barley, and Laurel oats seed-grain on infection by *Fusarium culmorum* [*R.A.M.*, xi, p. 293]. The seed coats were injured either by puncturing the embryo end, clipping off a small portion of the 'brush' end, or scarifying with sandpaper. The greenhouse tests showed that reduced emergence and increased foot rot uniformly followed the planting of injured seed of all three cereals, and similar results were obtained in the field with wheat, Mindum being more susceptible than Marquis. The injury of the seed evidently renders the endospermic nutrients accessible to the fungus, the growth of which is thus promoted at the expense of that of the plant.

SCHAFFNIT (E.). **Beiträge zur Kenntnis der Fusskrankheiten des Getreides. (I. Mitteilung). Cercosporella herpotrichoides (Fron) als Ursache der Halmbruchkrankheit des Getreides.** [Contributions to the knowledge of the foot rots of cereals. (Note I). *Cercosporella herpotrichoides* (Fron) as the cause of the straw-breaker disease of cereals.]—*Phytopath. Zeitschr.*, v, 5, pp. 493–503, 12 figs., 1933.

Attention has already been drawn to the prevalence in Germany of recent years of the 'straw-breaking' form of parasitic lodging of cereals [*R.A.M.*, xii, p. 158]. *Fusarium nivale* [*Calonectria graminicola*], *F. culmorum*, and other well-known species of *Fusarium* are commonly isolated from diseased plants, but the inconclusive outcome of inoculation experiments with these fungi showed that they are not primarily responsible for the symptoms. *Cercosporella herpotrichoides* [ibid., xii, pp. 279, 430] was ultimately isolated from infected wheat plants and induced to form fructifications on potato stem agar. Owing to the slowness of its development, this fungus is readily overgrown in culture by the above-mentioned *Fusarium* spp. On biomalt agar the mycelium of *C. herpotrichoides* is at first bluish-grey to mouse-coloured, later turning olive and spreading out like a fan. Its septate hyphae average 2 μ in width. The hyaline, acicular conidia are mostly more or less curved (sometimes only at the apex), multiseptate (up to 5 at maturity), 10 to 105 μ in length (mean 50 to 70 μ).

averaging 2 to 3 μ in width at the base and 1 to 1·5 μ at the apex; they are borne in groups of two to four on cylindrical conidiophores. Sporidia resembling the conidia in shape or cylindrical are developed in profusion on the conidia.

Three weeks after the inoculation of the leaf sheath with pure cultures of *C. herpotrichoides* just below soil level the first symptoms appeared on wheat, and a month later they became severe. At the same time winter barley was inoculated through the soil by means of infected straw, and in this case also the symptoms were noticeable after two to three weeks. The mycelium first penetrates the leaf sheath, causing the formation of pale, necrotic, brown-edged, elliptical lesions, 1 to 2·5 cm. long and $\frac{1}{4}$ to $\frac{1}{2}$ cm. wide. Similar lesions develop on the haulm within eight or ten days, while the adventitious shoots produced at a later stage are often destroyed by the fungus. The spots may occur close above the soil or up to 20 cm. along the haulm. Small, black, pseudoparenchymatous sclerotia develop on the necrotic areas and were also observed in culture. The hyphae permeate the vascular bundles, the lumen often being completely filled by the fungus. A certain correlation was detected between the prevalence of lodging and the development of the mechanical framework of the plant, the breadth of the sclerenchyma ring in the very resistant Maurener Dickkopf wheat variety being 71 μ with a cell wall thickness of 4·2 μ, compared with 55 and 3·15 μ and 61 and 3·25 μ, respectively, in two susceptible varieties.

Ophiobolus graminis, unlike *C. herpotrichoides*, is a vigorous parasite of the roots, whence it passes to the stem base. Diseased plants may be readily pulled up from the ground. This organism predominates on the lighter types of soil. In *C. herpotrichoides* the root is not attacked, but owing to the decay of the stem base the plant is liable to break on being pulled from the ground. At an advanced stage of infection the haulm cracks just above soil level, generally with a slight twist, and the plant collapses. In the case of non-parasitic lodging the affected haulms usually bend in the direction of the prevailing wind, whereas those attacked by *C. herpotrichoides* fall and become entangled at random. The length of the affected haulms is not appreciably reduced by the latter fungus, the damage consisting mainly in the diminution of yield and in the hindrance to harvesting through lodging. *C. herpotrichoides* is disseminated by conidia (the sole type of fructification so far observed) as well as through the soil. Wheat may suffer from this form of lodging on any kind of soil, but is less liable to injury on the lighter ones.

F. culmorum and *Calonectria graminicola* are chiefly pathogenic to seedlings, their establishment on older plants being probably secondary to necrosis or wounding of the stem base. *F. culmorum* developed actively on plants subjected to artificial lodging by the cracking of the haulms. *Cercosporella herpotrichoides* may well be one of the precursors of invasion by secondary *Fusarium* spp. The latter cause a brown discoloration of the haulm tissue up to about the third node, near which the salmon-coloured sporodochia appear.

The detection of *C. herpotrichoides* as the primary cause of cereal

lodging in Germany is not only of academic importance, but will also facilitate the study of the conditions governing infection by the parasite.

GREANEY (F. J.). **Experiments in the control of Oats rusts by sulphur dust.**—*Scient. Agric.*, xiii, 7, pp. 426–434, 1 fig., 1 graph, 1933. [French summary on p. 471.]

The results of field experiments (of the randomized Latin square type) in 1929 and 1930 at Winnipeg, Canada, showed that stem rust (*Puccinia graminis avenae*) and crown rust (*P. coronata avenae*) [*P. lolii*: *R.A.M.*, xii, p. 364] of oats were effectively controlled by applications of kolodust [ibid., xi, p. 286]. In 1929, a locally mild rust year, complete control was given by four dustings at the rate of 30 lbs. of the dust per acre, with intervals of seven days between each application. In 1930, when both rusts were severe, the best control was obtained by applications at the same rate but repeated at intervals of two days from 16th July to 22nd August: in plots so treated the yield of Victory oats was increased to 74·8 bushels per acre, as compared with 29·5 bushels in control plots.

The results [given in the form of correlation coefficients and regression equations] of the statistical study of the effect of the rusts on the yield of oats showed that the regression of yield on percentage rust was linear, indicating that uniform increases in rust infection result in uniform reductions in yield [ibid., xii, p. 426]. Under the conditions prevailing in 1930, each 10 per cent. increase in stem rust corresponded approximately to 7 per cent. reduction in yield, and crown rust was also found to be significantly correlated with yield.

On general lines, the experiments in both years are considered to indicate that the most satisfactory dusting schedules will have to be decided each year, according to weather conditions, the development of the rust, and the stage of plant growth, as well as to the measure of control already obtained by the previous dust applications.

DILLON WESTON (W. A. R.). **Sporulation of Helminthosporium avenae in artificial culture.**—*Nature*, cxxxi, 3308, p. 435, 1933.

Two Petri dishes containing potato agar were inoculated with mycelium from a non-sporing culture of *Helminthosporium avenae* [*R.A.M.*, xii, p. 163]. Three days later, the upper covers of the dishes were removed and replaced by disks of Sanalux glass, one half of which was painted over with India ink. Both cultures were then irradiated for ten minutes at a distance of 1 ft. from a Hanovia quartz mercury-vapour home model Alpine sun lamp, alternating current, 200 volts, followed by a further ten minutes' irradiation six days later. On microscopic examination of the cultures seven days after the second exposure, the mycelia on the irradiated halves were found to be strongly pigmented and to show profuse sporulation: on the non-irradiated portions pigmentation was very slight and sporulation absent. Similar experiments showed that sporulation can be induced in *H. avenae* by irradia-

tion with the light from a quartz mercury-vapour sun lamp, and by exposure in the open either to strong diffuse light or to sunlight.

Ловік (А. І.). Современное состояние вопроса о болезнях и повреждениях Кукурузы на Северном Кавказе. [Present position of the problem of the diseases and injuries affecting Maize in N. Caucasus.]—*Bull. N. Caucasian Inst. for Plant Protection*, Rostoff-on-Don, i (viii), 2, pp. 3–51, 2 pl., 1933. [English summary.]

The results of a survey started in 1929 of the diseases affecting maize in Northern Caucasus showed that the greatest damage to the crop in that region is done by dry rots of the cob caused by several species of *Fusarium* (e.g. *F. moniliforme* [*Gibberella moniliformis*: *R.A.M.*, xi, p. 778], *G. saubinetii*, and others), bacteriosis of the grain [the causal organisms of which are not indicated], and a physiological disease, characterized by the tendency of the maize grains in the cob to crack; the last-named trouble is usually associated with a white mouldy growth caused by a number of saprophytic fungi.

Laboratory and field experiments showed that, although the species of *Fusarium* causing the dry rots are carried in the seed and are present in the embryo, the disease is not transmitted to the seedlings; the viability of infected grains was found, however, to be considerably reduced. Both observations also apply to the seed infected with bacteria. There was ample evidence that the species of *Fusarium* and the bacteria are chiefly disseminated through the air, with or without the co-operation of insects, and that the chief source of infection is the maize refuse and dead plants left in the fields from one season to the next. The physiological trouble associated with white mould, on the other hand, was proved to be transmissible through the seed-grain, a fact which renders it imperative to select for sowing purposes cobs that show no signs of cracking of the grains.

The paper terminates with Russian descriptions of 47 species of parasitic and saprophytic fungi which were found to be associated with various diseases of the maize plants, among which the following may be mentioned: *Sclerospora maydis* Butl. [*S. indica*: ibid., xi, p. 546], *Leptosphaeria luctuosa* Niessl, *Mycosphaerella zeae*, *M. maydis*, *Phyllosticta zeina*, *Ascochyta zeina* [ibid., viii, p. 772], *Septoria maydis* [loc. cit.], *Oospora verticillioides* [ibid., x, p. 129], *Cephalosporium acremonium* [ibid., x, p. 644], *Nigrospora oryzae* [ibid., xi, p. 711], *Helminthosporium maydis* [ibid., x, p. 437], and *H. turcicum* [ibid., xi, p. 163]. The list also includes two species considered to be new to science, *Aposphaeria zeae* and *Colletotrichum zeae*. The former is characterized by sparsely dispersed brown pycnidia arising on a felted, dark brown mycelium covering the maize grains in the cob; the spores are elliptical or elongated, with rounded ends, hyaline, one-celled, and 4·5 to 5·7 by 3 μ in diameter. *C. zeae* developed on spots caused by *Ascochyta zeina*, forming a mycelium on which arose cylindrical, hyaline conidiophores and dark brown, septate setae; the spores were hyaline, short-clavate or oblong-ovate, and 8·4 to 18·2 by 4·9 to 5·6 μ in diameter.

The bibliography appended comprises 108 titles, almost exclusively of Russian papers.

[Nattrass (R. M.)]. **The Diplodia rot of Citrus fruits. A possible menace to the Cyprus Citrus industry.**—*Cyprus Agric. Journ.*, xxviii, 1, pp. 24–27, 2 figs., 1933.

Since 1932 *Diplodia natalensis* [*R.A.M.*, ii, p. 543; ix, p. 777] has been observed causing gummosis and die-back of the trunks and branches of citrus trees in Cyprus, though it has not been found on the fruits either in the packing sheds or on arrival in England. The disease begins as a exudation of gum, and as it progresses large areas of bark are killed and a branch may become completely ringed, resulting in the death of the entire limb. Occasionally, the attack is confined to one side of a large branch, where it produces elongated cankers. Later, the affected tissue dries up and abundant fruit bodies are produced under the bark, which splits and peels off, leaving a powdery spore mass to be dispersed by the wind. When inoculated into fruits the fungus produced a rot closely resembling the Palestine form [ibid., xii, p. 21] and is therefore regarded as a grave potential danger to the whole citrus industry in Cyprus.

Growers are strongly urged to make a thorough search for any signs of the disease and to remove and burn systematically every affected branch.

Rayner (M. Cheveley). **Mycorrhiza in the genus Citrus.**—*Nature*, cxxxi, 3307, pp. 399–400, 1933.

The writer reports the presence of the Phycomycete type of mycorrhiza in both sweet and sour oranges in the orchards of southern California [cf. *R.A.M.*, xii, p. 309], where the young roots show a regular and quite characteristic distribution of mycelium bearing large vesicles, involving inter- and intracellular infection with periodic digestion of the intracellular system of hyphae and their contents. The practical significance of this discovery lies in its application to manurial practices, the present inconsistent response to which may be correlated with the condition of the roots in regard to fungus infection.

Sharples (A.). **Lightning storms and their significance in relation to diseases of (1) Cocos nucifera and (2) Hevea brasiliensis.**—*Ann. of Appl. Biol.*, xx, 1, pp. 1–22, 2 pl., 3 figs., 1933.

As a result of field investigations and extensive inquiries among the local estate-owners since 1928, the author states that the cause in Malaya of the heavy annual losses in tall coco-nut palms, with symptoms which were described in a previous communication [*R.A.M.*, viii, p. 305], has been definitely traced to lightning injury and its after-effects [ibid., x, p. 160]. So far no evidence has been obtained of the presence of species of *Phytophthora* in the bud rot (termed 'false bud rot' in this paper) caused by lightning, but the possibility is not precluded that future observations may result in a species of this genus being found as a causal agent of bud rot of coco-nut palms in Malaya. It was further established that the

association of *Marasmius palmivorus* [ibid., viii, p. 305] with the disease is only secondary, this fungus simply accelerating the defoliation of the stricken palms and having nothing to do with the actual rotting of the tissues.

The investigation also showed that lightning is of some importance in the causation of disease in *Hevea* rubber plantations. In four- to twelve-month-old trees the lightning injury is usually followed by a die-back, in which the green bark turns black with the appearance at a later stage of three or four different caulicolous fungi, finally resulting in death. In such trees the losses are not important, for the young trees are seldom killed outright and rapidly regenerate when cut back to stump height. The root system is not affected. In four- or five-year-old trees slightly affected by lightning a patch of discoloured tissue was found at the collar, showing symptoms exactly similar to those of patch or claret-coloured canker, and isolations yielded a species of *Pythium* [ibid., x, p. 160], the source of which may possibly be the soil or the bark fissures of the trees.

KWASHNINA (Mme E. S.). Бактериальный гоммоз Хлопчатника на Таманском полуострове по данным наблюдений в **1931** г. [Bacterial gummosis of Cotton in the Taman peninsula, according to observations in 1931.]—*Bull. N. Caucasian Inst. for Plant Protection*, Rostoff-on-Don, i (viii), 2, pp. 52–68, 2 pl., 2 graphs, 1933. [English summary.]

This is a detailed account of a generalized bacteriosis of the cotton plant which was very prevalent in 1931 in the newly established cotton fields in the Taman peninsula [Black Sea littoral of Northern Caucasus]. The disease [which has been attributed to *Bacterium malvacearum* and some other forms: *R.A.M.*, xi, pp. 41, 316] affected the cotyledons, stems, petioles, leaves, and bolls, producing symptoms which are described and are stated to resemble closely those associated with angular leaf spot and black arm of cotton, including a severe boll and lint blight. The epidemic outbreak of the disease in 1931 is chiefly ascribed to the exceptionally wet weather which prevailed from May to September, the total rainfall for that period being 341 mm. as compared with the local normal average of 131·5 mm. From September onwards, as the weather became more settled, the incidence and severity of new infections decreased, with the result that the later pickings of the crop were considerably healthier than the earlier.

Field observations in several localities indicated the existence of varietal differences in the relative resistance to the disease of 26 varieties of American Upland cottons [*Gossypium hirsutum*] which were experimentally grown, although none of them was completely immune. In this group the varieties 1306, 2013, and 182 were the least severely attacked by the stem and boll forms of the disease, which are stated to be the most destructive under the local conditions. Varieties of *G. herbaceum*, as a class, showed considerably greater resistance, and some of them gave indications of complete immunity.

There was further evidence that sowing cotton on autumn-fallowed soil tended to reduce the incidence of early infections.

Tests with various manures showed that applications of a fertilizer containing phosphorus and potassium reduced the incidence of the disease from 83·5 per cent. in the control to 31·3 per cent., while applications of a nitrogenous fertilizer reduced the percentage of attack to 25·6. The use of relatively resistant varieties, e.g., Upland 1306, may also tend to minimize the losses.

Mihra (R. D.). **The Khandesh Cotton breeding scheme, 1926–32.**—12 pp., 6 figs., Indian Central Cotton Ctte, Ballard Estate, Bombay, 1933.

A summary is given of the work carried on from 1926 to 1932 at the Dhulia and Jalgaon farms, with special reference to the culture, isolation, and purification of the *Gossypium neglectum* and Bani-Comilla cross, generally known as Banilla. This strain was found to show a high degree of resistance to wilt [*Fusarium vasinfectum*: *R.A.M.*, xi, p. 781], and arrangements were made for its extended cultivation. Promising results have also been obtained with *Malvensis* 40, a strain isolated from *G. neglectum*, which is wilt-resistant, gins up to 36 per cent., and has $\frac{3}{4}$ in. staple. *N. R.* 5 (roseum) [*G. neglectum* var. *rosea*] and Berar 23 also proved satisfactory in respect of wilt resistance at Jalgaon from 1930–2, but Dhulia 2 and B XXI 1 had to be discarded on account of their susceptibility to this disease.

Liddo (S.). **La 'Blastocystis hominis' nel tubo digerente delle mosche e nell'ambiente. Ricerche sperimentali.** [*Blastocystis hominis* in the digestive tract of flies and in the atmosphere. Experimental studies.]—*Pathologica*, xxv, 496, pp. 116–118, 1933. [German and English summaries.]

Blastocystis hominis [*R.A.M.*, ix, p. 525] in the digestive tract of flies (*Musca domestica*) in Italy was observed to undergo regressive changes, suggesting that this situation is not a favourable one for the maintenance and growth of the organism. In faeces exposed to the air the fungus does not remain viable for more than three to four days, so that the possibilities of the transmission of the disease in an active state by flies are very restricted.

Gilman (R. L.). **The incidence of ringworm of the feet in a university group. Control and treatment.**—*Journ. Amer. Med. Assoc.*, c, 10, pp. 715–717, 1933.

Among 500 men and 285 women students examined at Philadelphia, 60 per cent. of the former and 57 per cent. of the latter were found to be suffering from ringworm of the toes [*Trichophyton mentagrophytes* and other fungi: cf. *R.A.M.*, x, p. 243; xii, p. 291]. The most common additional involvement was tinea cruris, while infections of the hands and nails and plantar warts were of rare occurrence. The treatment of the condition is discussed.

Legge (R. T.), Bonar (L.), & Templeton (H. J.). **Epidermomycosis at the University of California. Study III.**—*Arch. of Dermatol.*, xxvii, 1, pp. 12–24, 1933.

A study has been made of the toxicity of a number of chemicals

to three dermatophytes implicated in the causation of ringworm of the feet in California, viz., *Trichophyton interdigitale* [*T. mentagrophytes*: see preceding abstract], *T. rosaceum*, and *Epidermophyton cruris* [*E. floccosum*: *R.A.M.*, x, p. 243; xii, p. 291]. Of these organisms, the first named was shown to be consistently more resistant to the action of thymol, salicylic acid, and hexylresorcinol [ibid., x, p. 46] than the others, and further tests were therefore made on this fungus alone. The test cultures (spore suspensions) were incubated at 25° C. and the experiments carried out at 20° to 22°, the duration of exposure to the chemicals being five minutes.

Sodium thiosulphate was found to be ineffective at 10 per cent. even when the period of exposure was extended to 48 hours, an important fact in connexion with the use of this preparation for foot baths. Metaphen failed to sterilize the cultures at 1 : 500 to 1 : 5,000, while paraffin (kerosene) at full strength was also ineffectual. Hexylresorcinol proved effective at 1 : 3,000, merthiolate at all dilutions up to and including 1 in 10,000, and iodine at 1 in 100,000. Sodium hypochlorite and solution of chlorinated soda killed all the spores at the concentration (1 per cent.) recommended for foot baths, while chlorox was toxic at 1 in 5,000.

In order to test the efficacy of the new 'cold quartz light' with its short wave length of 2,500 ångströms, cultures of *T. mentagrophytes* were irradiated by this method for 1 to 15 minutes at a distance of 5 in. [ibid., xii, p. 443]. The outcome of this experiment showed that the waves possess definite fungicidal properties, though complete sterilization was not secured. The best results were given by ten minutes' exposure.

High toxicity to spore suspensions of the dermatophytes does not necessarily connote a corresponding therapeutic value on direct application to the skin, and a number of chemicals were therefore tested on skin scales infected by *T. mentagrophytes*, which were immersed in solutions of varying strength for periods up to two hours. Complete sterilization was afforded by 50 per cent. alcohol in 90 minutes, by thymol (3 per cent. in 50 or 5 per cent. in 95 per cent. alcohol) in 30 minutes, by salicylic acid (6 per cent. in 70 per cent. alcohol) and benzoic acid (5 per cent. in 95 per cent. alcohol) in 30 minutes, a new dye, crystol (resorcin crystal violet hydrochloride) in 30 minutes, 1 per cent. chlorinated soda in one hour, and iodine (1 per cent., 1 : 1,000, and 1 : 10,000) in 15 minutes.

MUSKATBLIT (E.). **Observations on Epidermophyton rubrum or Trichophyton purpureum.**—*Mycologia*, xxv, 2, pp. 109–116, 3 figs., 1933.

Two different types of cultures, one cerebriform and one downy, were isolated from each of two patients with lesions of the glabrous skin. The cerebriform type agreed in the main with *Epidermophyton* [*Trichophyton*] *rubrum*, and the downy one with *T. purpureum* [*R.A.M.*, xi, p. 44]. The latter cannot be considered as a pleomorphic degeneration of the former, since (1) it developed as a white and downy primary colony directly from planted scales; (2) it showed profuse and typical sporulation in contrast to the

sterility or scanty development of pleomorphic cultures; and (3) it underwent pleomorphic degeneration.

Two possible explanations of the phenomenon under observation are advanced. (1) The same fungus exists in at least two stable varieties, one red cerebriform, with a predominance of chlamydospores and multilocular spindle spores, this being of the type of *T. rubrum*. The other variety is white and downy, with red pigmentation of the substratum, and lateral conidia as the main form of sporulation, and is of the type of *T. purpureum*. Both varieties can be isolated in rare instances in primary plantings from the same patient. (2) The red, cerebriform and the white, downy types represent two distinct fungi (*T. rubrum* and *T. purpureum*, respectively), and may occur in the same individual as a simultaneous mixed infection with two pathogens.

CATANEI (A.). **Résultats de l'étude des teignes dans quelques agglomérations de la côte occidentale de l'Algérie et d'une nouvelle enquête en Oranie.** [The results of the study of the ringworms in some settlements on the west coast of Algeria and of a new inquiry in Oran.]—*Bull. Soc. Path. Exot.*, xxv, 7, pp. 694–699, 1932.

Continuing his researches on the incidence of the various types of ringworm affecting native, Jewish, and European children in Algeria, the writer extended his observations to certain ports and villages on the west coast and collected new data in Oran [cf. *R.A.M.*, x, p. 521]. The total cases examined numbered 3,443, of whom 2,209 were Jewish and European and the rest African natives.

Trichophyton violaceum was the predominant cause of ringworm among the white coastal population, followed by *T. glabrum*, *T. acuminatum*, and *T. fumatum* (formerly identified with *T. crateriforme*) [ibid., xi, p. 373]. Native children in the same regions suffered mainly from favus (*Achorion schoenleini*), ringworm when present being mostly of the smooth type associated with *T. glabrum* and *T. violaceum*, while *T. acuminatum* was prevalent in one locality. *T. violaceum* and *T. glabrum* were responsible for most of the ringworm cases at Tlemcen (Oran) in native children, the former also predominating in the Jewish colony.

CATANEI (A.). **Description de Trichophyton gourvili n. sp., agent d'une teigne de l'homme.** [Description of *Trichophyton gourvili* n. sp., the agent of a human ringworm.]—*Bull. Soc. Path. Exot.*, xxvi, 3, pp. 377–381, 1 pl., 1933.

From a ringworm of the scalp affecting native children in French West Africa, the writer isolated a species of *Trichophyton* characterized by an irregular mycelium, arthrospores, large chlamydospores, and a relatively small number of piriform aleuria, measuring on an average 5 by 3 μ but sometimes up to 6·5 by 4 μ. Spindles were formed on a barley grain medium. Details are given of the cultural characters of the fungus on various nutrient media. The general aspect of the colonies is waxy, with folds, convolutions, and peripheral rays, and the colour light to dark violet according to the substratum. A pleomorphic white 'duvet'

develops on Sabouraud's glucose agar. The fungus is named *T. gourvili* n. sp.

Gougerot [H.], Burnier, & Duché [J.]. **Mycose végétante et ulcéreuse due au 'Cephalosporium griseum'.** [A spreading and ulcerous mycosis due to *Cephalosporium griseum*.]—*Bull. Soc. Franç. de Dermatol.*, *1933*, 3, pp. 417–418, 1933.

From a spreading ulcer succeeding to an injury with a piece of rusty iron on the leg of a male patient the writers isolated a species of *Cephalosporium* characterized by elongated or oval conidia, 24·3 by 5·4 μ, aggregated into heads 27 to 30 μ in diameter [cf. *R.A.M.*, xii, p. 290]. The organism is closely related to *C. koningi* (spherical conidia 10 to 25 μ in diameter) and is named *C. griseum* n. sp. On Sabouraud's medium the fungus forms greyish, tufted colonies.

Gougerot [H.], Blum (P.), & Meyer (J.). **Pityriasis versicolor achromiant chez une négresse.** [Achromatic pityriasis versicolor in a negress.]—*Bull. Soc. Franç. de Dermatol.*, *1933*, 3, pp. 420–421, 1933.

Malassezia furfur was isolated from three types of lesions associated with achromatic pityriasis versicolor in a negress in France [cf. *R.A.M.*, ix, pp. 244 *et passim*].

Allhusen (E. L.). **Brewing and factory legislation.**—*Journ. Inst. of Brewing*, N.S., xxx, 3, pp. 98–102, 1933.

Discussing the risks to which brewery employees are exposed, the author draws attention to the prevalence among maltmen of bronchial troubles attributable in part to the occurrence in the raw barley and malt dust of *Penicillium* spores. Examination of the sputa of maltmen has shown that nearly 50 per cent. of them have spores in their bronchial tubes, often in large numbers. So far the spores have not been found actually growing in the organs, though they can be cultured from the sputum at room temperature. These spores may persist for a long time in the air passages, having been found in a man four months after he had ceased work in the maltings, and it is possible (though not proved) that under certain conditions they may directly affect the respiratory organs.

Léger (L.) & Gauthier (Mlle M.). **Endomycètes nouveaux des larves aquatiques d'insectes.** [New Endomycetes in the aquatic larvae of insects.]—*Comptes rendus Acad. des Sciences*, cxciv, 26, pp. 2262–2265, 3 figs., 1932.

An account is given of the writers' studies on a new group of fungi found parasitizing the larvae of Chironomidae in Alpine waters. The fungi occur either on the peritrophic membrane of the middle gut or in the rectal cuticle, the former being represented by two new genera of the family Harpellaceae (cf. *Comptes rendus Acad. des Sciences*, clxxxviii, p. 951, 1929), *Stachylina* and *Opuntiella*, and the latter by three new genera of the family Genistellaceae, namely, *Stipella*, *Genistella*, and *Orphella*.

Stachylina comprises at least two species, viz., *S. longa*, characterized by a long eccrinian tube producing, from the apex to the

base, a succession of 6 to 8 conidia 25 μ in diameter, and *S. macrospora*, the tube of which is only 100 μ long and develops into a head of 6 to 8 pedunculate conidia 40 μ in diameter. Both these species attack the larvae of *Diamesa*, the former occurring also in those of *Cricotopus*, *Tanytarsus*, and others.

Opuntiella digitata, a parasite of *Trissocladius*, consists of a simple tube ending in a short racquet-shaped conidiophore with 5 to 6 sessile, tubular conidia, 20 μ in diameter, side by side.

Stipella vigilans n. sp. emerges from a mucous cupule by means of a simple or forked stipe prolonged by a main axis emitting lateral branches bearing a succession of cylindrical, unilateral conidia, 70 to 80 μ in diameter. The arbuscule may attain a length of 1 mm. A biconical, curved zygospore, measuring 80 to 100 μ, is inserted perpendicularly on a branch. This species is found in the rectum of Simulid larvae, often in company with *Paramaebidium*.

G. ramosa n. sp., a rectal parasite of *Baetis rhodani*, also associated with *Paramaebidium*, is characterized by an extensively branched thallus producing conidia 35 to 40 μ in diameter and biconical zygospores inserted obliquely on a branch. The genus, which is represented by a number of other species attacking the larvae of Ephemeridae, Nemuridae, Simulidae, Chironomidae, and Tipulidae, may be recognized by its unilateral heads of navicular conidia, resembling a tuft of broom.

Orphella coronata n. sp., occurring in the larvae of *Protonemura humeralis*, is affixed to the host by a broad dome-shaped structure with two radicles. The stipe attains a length of 1 mm., and the banana-shaped conidia measure 45 to 50 μ. A more squat species of *Orphella* occurs in the larvae of *Nemura variegata*.

In the genera *Genistella* and *Stipella* sexual reproduction has been observed to take place by means of two cells from contiguous branches, which fuse into a large, pedunculate, thick-walled zygospore; the early phases of the process are reminiscent of those described by Thaxter for *Entomophthora sepulcralis* and suggest an affinity between the new groups of Endomycetes and the Entomophthorales [*R.A.M.*, viii, p. 502].

DRECHSLER (C.). **Morphological diversity among fungi capturing and destroying nematodes.**—*Journ. Washington Acad. Sci.*, xxiii, 3, pp. 138–141, 11 figs., 1933.

The fungus described by Zopf (*Nova Acta K. Leop.-Carol. Deutsch. Acad. Naturforsch.*, lii, p. 314, 1888) as *Arthrobotrys oligospora*, together with three other apparently closely related species, has been encountered, causing the death of immense numbers of nematodes (mostly *Rhabditis* and *Diplogaster* spp.) in agar plate cultures prepared from plantings of diseased rootlets or other decaying plant materials. A brief description is given of the morphology of the fungi under observation, all of which agreed in their manner of capturing the nematodes in one or more anastomosing hyphal loops coated on the inner surface with a transparent highly adhesive substance. One or more narrow processes then perforated the integument under the loop and swollen hyphae eventually occupied all or most of the body cavity. Three more

species of the same type but with three- or four-septate conidia instead of the bicellular ones of the first group captured their prey by a strongly adhesive disk-shaped cushion on the swollen ends of the hyphae. Several other fungi of similar habits are briefly mentioned.

HARRIS (J. J.). **Formation of 'buttons' in sweetened condensed milk by Monilia niger.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 1–4, pp. 58–61, 2 figs., 1933.

Monilia niger [*Torula nigra* Sacc. and Trav.] was found to be responsible for the formation of small, brown, button-like clumps in sweetened condensed milk at Shelbyville, Illinois. The fungus is characterized by clusters of budding cells, 5 by 4 μ in diameter, and forms glistening, smooth, opaque, butyrous, odourless, very dark brown colonies on a plain agar slant. Acid was produced without fermentation in xylose, arabinose, dextrin, galactose, maltose, mannose, mannite, and levulose. The organism at 10,000 per c.c., when dried in a film, resisted ten minutes' exposure to 240° F. but was killed by five minutes in steam.

TIDDENS (BERBER A.). **Wortelrot van Primula obconica veroorzaakt door Thielaviopsis basicola (Berk. et Br.) Ferraris.** [Root rot of *Primula obconica* caused by *Thielaviopsis basicola* (Berk. et Br.) Ferraris.]—Thesis, University of Utrecht (Hollandia-Drukkerij, Baarn), 82 pp., 4 pl., 2 graphs, 1933. [English summary.]

Primula obconica plants in Dutch nurseries are stated to have been severely affected of recent years by a root rot, the first symptom of which is the development of small, black spots on the roots, later extending into a brown discoloration, sometimes accompanied by complete disintegration. The oldest leaves shrivel, while the others turn yellow, except the youngest, which is stunted and may assume a greenish-red tinge. In milder cases the older leaves show a greenish-yellow or white mottling of the leaf parenchyma [cf. *R.A.M.*, v, p. 669]; the principal veins, however, retain their normal colour.

The black spots were found to bear masses of chlamydospores of *Thielaviopsis basicola* [ibid., ix, p. 17], the mycelium and spores of which were also detected in the disintegrated root tissues. The pathogenicity of the fungus was proved by inoculation tests, which were most successful at a temperature range of 20° to 26° C. and on plants growing in culture solutions at hydrogen-ion concentrations of P_H 4·8, 5·6, and 6·4; at P_H 7·2 and 8 less damage was caused. In another series of experiments the reaction of the soil in which the primulas were growing was adjusted by the addition of calcium carbonate, sodium nitrate, ammonium sulphate, or sulphuric acid to 7 to 7·5, 6·8, 6·5, and 5·9 to 6·4, respectively. On inoculation with *T. basicola* the plants growing on all of these except the sodium nitrate and the control (ordinary soil), both of which had a P_H value of 6·8, were severely infected, the two series at 6·8 showing only mild symptoms. Nurserymen have found that primulas grow best in a mixture of one-third each of garden

soil, leaf mould (over a year old), and well-prepared manure, peat litter, and sand. The fungus was found to be soil-borne.

In cross-inoculation experiments primula plants were more severely attacked by the strains from the same host than by that from tobacco [see above, p. 493], while a strain from poinsettia [*Euphorbia pulcherrima*] was the least virulent. Similarly, tobacco plants were more heavily infected by the tobacco strain than by that from poinsettia, while the primula strains were still less injurious. Kidney bean [*Phaseolus vulgaris*] plants suffered the greatest damage from the poinsettia strain and the least from those from primulas, the tobacco strain being intermediate in its effects. Inoculation tests on *Primula malacoides* with the two primula strains gave positive results.

Good control of *T. basicola* was given by soil disinfection with 40 per cent. formalin (½ l. in 6 l. water at 50°) or 0·25 per cent. uspulun at least ten days before planting.

BREMER (H.). **Zur Kräuselkrankheit der Pelargonien.** [On the curl disease of Pelargoniums.]—*Blumen- und Pflanzenbau*, xlviii, 3, pp. 32–33, 2 figs., 1933.

A popular note is given on the symptoms and conjectural etiology of the leaf curl of *Pelargonium zonatum* in Germany, together with a brief summary of Verplancke's work on this disease in Belgium [*R.A.M.*, xi, p. 649].

STAPP (C.). **Die Gelbfäule (Gelbkrankheit) der Hyazinthen.** [The yellow rot (yellow disease) of Hyacinths.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xx, 3, pp. 309–324, 10 figs., 1933.

Among the diseases disqualifying flower bulbs from entry into Germany under an Order of 7th July, 1930, is yellow rot of hyacinths (*Pseudomonas hyacinthi*) [*R.A.M.*, x, p. 560]. Considerable dissension having arisen as to the interpretation of the Order between the Dutch bulb-exporters and German consignees, the writer investigated the disease with a view to defining some of the more important points in dispute.

It is undoubtedly possible to diagnose yellow rot on the basis of external symptoms alone, provided these are not obscured by secondary infections. The softness of the bulb under pressure is merely suspicious, conclusive proof of the disease being afforded solely by the presence of yellow to yellowish-brown 'blobs' or longitudinal discoloured stripes on the white, fleshy bulb-scales, and of yellow bacterial slime in the tracheae of the scales. It is by no means certain, moreover, that any of the rod-shaped bacteria swarming in the yellow exudate from the tracheae or vascular bundles of affected bulbs are the agents of yellow rot; they must first be subjected to examination for the presence of some important distinguishing features, e.g., the typical colony shapes (including the teratological filamentous forms with swollen centres in old bouillon cultures), the capacity for growth even in bouillon with an admixture of ethyl alcohol or chloroform, the coagulation of milk without souring, the slow liquefaction of gelatine and formation of thick, yellow layers on potato and carrot slices, and the

decomposition of various sugars without gas production. The pathogenicity of the organism should then be tested on healthy hyacinth bulbs, preferably of the susceptible L'Innocence variety.

The statements in the previous literature on yellow rot concerning the 'brown' or 'yellowish-brown' centres of the lesions appear to rest on the frequent association of fluorescent bacteria with *P. hyacinthi*; the latter by itself can only produce a yellow discoloration.

E. F. Smith's data on the morphological, cultural, and physiological characters of the yellow rot organism were confirmed and supplemented, with a few minor rectifications. The optimum temperature for the development of *P. hyacinthi* was found by the writer to extend over a slightly wider range than that fixed by Smith, i.e., 25° to 30° instead of 28° to 30° C., while the minimum should be placed at 0° rather than 4°; the thermal death point lies between 48° and 49°.

The inspection of over 3,000 hyacinth bulbs imported from Holland during 1930–1, comprising the varieties Grandeur à Merveille, General de Wet, Gigantea, Gertrude, L'Innocence, Queen of the Blues, and Queen of the Pinks, showed that the growers are well able to produce healthy material for export, especially by availing themselves of prophylactic measures of proved efficacy [ibid., x, p. 598].

Tranzschel (W. A.). Ржавчина Кендыря (**Melampsora apocyni Tr.**). [Rust of Kendir fibre (*Melampsora apocyni* Tr.).]—*Plant Protection*, Leningrad, viii, 5–6, pp. 531–533, 1931. [Received June, 1933.]

The author states that the rust *Melampsora apocyni* [*R.A.M.*, xi, p. 182] is very prevalent in all the regions of Russia and Central Asia where kendir fibre [*Apocynum venetum*] has been introduced, and that its economic importance is steadily increasing. For this reason he gives a somewhat revised translation of Sydow's description of the fungus, as follows. The uredosori are hypophyllous, orange-yellow, and 0·2 to 0·4 mm. in diameter. The uredospores are globose or broadly elliptical, hyaline, densely covered with obtuse warts, and measure 17 to 22 by 16 to 18 μ; paraphyses are numerous, hyaline, clavate, 35 to 42 μ long and 18 to 25 μ broad at the thickened end. The teleutosori are also hypophyllous, 0·2 to 0·5 mm. in diameter, usually coalescing in irregular groups, at first reddish-brown, later brownish-black; the teleutospores are prismatic or cylindrical-prismatic, usually rounded at the apex, light brown, and 35 to 42 by 7 to 13 μ.

It is thought probable that the rust is monoecious and suggestions are made for seeking the aecidial stage on the same host in the spring. Provisionally the best means of control is considered to be the removal from the fields or the ploughing-in in the spring of all infected plant material.

Milbrath (D. G.). **Report on a survey for Phymatotrichum omnivorum in San Diego County, California.**—*Plant Disease Reporter*, xvii, 2, pp. 15–16, 1933. [Mimeographed.]

Out of 28 lucerne fields inspected in the autumn of 1932 by

G. L. Stout at an altitude of 3,000 to 4,000 ft. in San Diego County, California, to confirm a report of the presence of *Phymatotrichum omnivorum*, 11 (all on one ranch adjoining the Mexican frontier) were found to be infected, some of them very severely. The fungus was also observed on cottonwood [*Populus deltoides*] which it had apparently destroyed. The source of infection is not known but is believed to be outside the County; possibly the cotton root rot organism may have been washed into the valley by flood waters from the mountains directly across the frontier line. The prospects of lucerne cultivation in the affected locality are considered to be very poor.

Karshuk (A. A.). Бактериологическое изученне корневого рака плодовых деревьев. [Bacteriological study of crown gall of fruit trees.]—*Bull. N. Caucasian Inst. for Plant Protection*, Rostoff-on-Don, i (viii), 2, pp. 69–78, 1933. [English summary.]

After a brief reference to the rapidly increasing economic importance of crown gall (*Bacterium tumefaciens*) of fruit trees in Northern Caucasus [*R.A.M.*, x, p. 603], the author gives details of his bacteriological studies of several isolations of the organism from various hosts and from the soil in infected orchards, the results of which showed their entire identity in morphological and cultural characters. All the isolations tested were shown to be equally virulent to beet, tobacco, and tomato; in one experiment, in which healthy tomato seed was watered after sowing with a suspension of *Bact. tumefaciens*, at first the seedlings emerged normally, but a week after emergence some of the seedlings began to die off, with distinct microscopical galls at the base of their stems. The surviving seedlings were dug out a month later, when 20 per cent. of their number bore well-formed galls at the crown, some attaining the size of a pea; swellings on the rootlets without the formation of definite galls were also found. It is thought probable that infection of the seedlings took place before their stems became lignified, or perhaps even earlier, at the time when the embryos began to break through the seed coats.

While it was experimentally shown that mercuric chloride, copper sulphate, and chloride of lime are useless for the disinfection of soil naturally or artificially infected with *Bact. tumefaciens*, preliminary tests in which infected soil was subjected in hermetically sealed containers to the action of chlorpicrin, showed that at the dose of 10 c.c. of chlorpicrin to 1 c.m. of the enclosed space, the substance penetrated to a depth of 20 cm. in the soil and effectively killed the bacteria in it. Cultures of the organism were killed after one hour's sojourn in an atmosphere containing over 6 c.c. chlorpicrin per c.m.

Pickett (W. F.) & Filinger (G. A.). **Spraying fruit plants.**—*Kansas Agric. Exper. Stat. Circ.* 169, 34 pp., 20 figs., 1932. [Received May, 1933.]

In this paper (a revision of *Circular* 145) directions are given in popular terms for the treatment of some well-known diseases and pests of fruit trees by spraying with standard preparations. The

symptoms of the diseases are briefly described, with notes on varietal susceptibility and other points of interest.

CSORBA (Z.). **Untersuchungen über die Ursachen der Empfänglichkeit und Widerstandsfähigkeit der Apfelsorten gegen den Apfelmehltau.** [Investigations on the causes of the susceptibility and resistance of Apple varieties to Apple mildew.]—*Mezögazdasági-Kutatások*, Budapest, v, pp. 326–339, 1932. [Abs. in *Chem. Zentralbl.*, civ, 19, p. 2962, 1933.]

Investigations at the Budapest Institute for Plant Diseases showed that the outer wall of the epidermal cells is thinner (average 2·13 μ) in apple varieties susceptible to mildew (*Podosphaera leucotricha*: see next abstract] than in resistant ones (2·67 μ).

JANCKE (O.). **Ueber den Einfluss der Kalidüngung auf die Anfälligkeit der Apfelbäume gegen Blutlaus, Blattlaus und Mehltau.** [On the influence of potash fertilizing on the susceptibility of Apple trees to the woolly aphis, green Apple aphid, and mildew.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xx, 3, pp. 291–302, 1 plan, 1933.

Contrary to the results of Schaffnit's and Volk's experiments on the effects of nutrition on the reaction of various plants to fungous parasites [*R.A.M.*, ix, p. 473], the writer obtained no improvement in the condition of apples suffering from mildew (*Podosphaera leucotricha*) [ibid., xii, p. 298] by the application of potash, which was applied as potassium nitrate and potassium chloride at the rate of 1 and 0·8 gm., respectively, per l. of nutrient solution.

BARTHELET (J.). **Le blotch fumeux des Pommes.** [Sooty blotch of Apples.]—*Bull. Soc. Nat. Hort. de France*, Sér. 5, vi, 3, pp. 149–150, 1 fig., 1933.

Sooty blotch (*Gloeodes pomigena*) [see above, p. 488] is stated to be of frequent occurrence on Reinette [Pippin] Clochard, Frémy, and Grand'mère apples in Charentes, Deux-Sèvres, and other parts of France where orchards have been planted on damp sites. The marketable value of the fruit is much reduced by the lesions; these may be removed by means of a decolorizer which gives the skin the appearance of a grey Canadian pippin, but this is a tedious operation in the course of which the apples are very liable to injury. Good control may be obtained by the application of a copper fungicide, supplemented if necessary by a summer treatment with lime-sulphur. [An account of this work also appears in *Rev. Path. Vég. et Ent. Agric.*, xx, 3, pp. 135–138, 1 pl., 1933.]

HUBER (G. A.). **Aspergillus sclerotiorum, n. sp., and its relation to decay of Apples.**—*Phytopath.*, xxiii, 3, pp. 306–308, 1 fig., 1933.

From 1926 to 1929 eleven forms of *Aspergillus* were isolated from the surface of normal apples in Washington, and since the latter year a further three have been investigated from the same source [*R.A.M.*, x, p. 398; xi, p. 378]. Only one of the forms recently examined proved pathogenic on Jonathan apples, causing decay both at common and cold storage temperatures. It belongs

to the *A. ochraceus* group, *sulphureus* series, of Thom and Church [ibid., v, p. 700], and is named *A. sclerotiorum* n. sp., with a diagnosis in English.

On Czapek's solution agar the fungus forms sulphur-yellow (Ridgway) colonies, reaching a diameter of 35 mm. in ten days at 25° C. Loose, hemispherical to columnar conidial heads are formed, commonly splitting into two or more divergent columns, the hemispherical measuring up to 140 μ in width and the columnar up to 250 by 140 μ; they are borne on pale yellow, pitted stalks, up to 1,200 by 6 to 12 μ, widening slightly towards the head. The globose to flask-shaped vesicles measure up to 40 μ in diameter, and the primary and secondary sterigmata up to 8·5 μ in length. The conidia are globose, smooth, 2 to 3 μ in diameter, with slightly yellow-tinged walls. Subglobose to globose, white, later flesh-pink sclerotia, up to 1·5 mm. in diameter, begin to appear on three-day-old cultures and subsequently develop in profusion.

On inoculation into sound, ripe apples, the fungus produced lesions measuring 42 to 46 mm. in diameter after 42 days at 22° to 25°, the corresponding measurement at 4° to 6° being 16 to 23 mm. After 90 days at the latter temperature the lesions had reached a diameter of 28 to 38 mm., while at 0°–2° the diseased areas measured 10 to 14 mm. after 120 days. The lesions were slightly sunken and showed a tendency to concentric ring formation. The decayed tissue was dark tan, dry, and spongy.

KUNKEL (L. O.). **Insect transmission of Peach yellows.**—*Contrib. Boyce Thompson Inst.*, v, 1, pp. 19–28, 3 figs., 1933.

In this paper the author reports the first successful insect transmission of peach yellows [*R.A.M.*, xi, p. 521], the leafhopper *Macropsis trimaculata* (Fitch) alone out of a number of insects tested transferring the disease to 7 out of 74 healthy seedling peaches after feeding on diseased ones.

M. trimaculata, reported on plums in New York and other States and on peaches in Virginia, was numerous on both peach and plum trees in the vicinity of New York City in the summers of 1931 and 1932. Both nymphs and adults feed on twigs, large branches, and occasionally on leaves. They prefer old branches and trees to young ones, a fact which may account for the small percentage of successful transmissions of yellows to young peach plants. They produce only one generation a year, and transmission tests are possible only during the relatively short periods when the young broods are feeding.

In the author's experiment nymphs and adults were transferred from healthy and 'yellowed' orchard trees to insect-proof cages containing yellowed peach seedlings in pots. After remaining on the diseased seedlings for 2 to 21 days the insects were transferred to healthy seedlings in other cages, colonies of 2 to 100 individuals being allowed to feed for various periods between 3rd June and 7th August, 1931, on the healthy seedlings immediately upon removal from the yellowed ones. After exposure to the insects, all the seedlings were kept in a greenhouse free from sucking insects, and were then placed outside on 15th September in uncovered cold frames with control trees and trees exposed to

another insect, to become hardened before going into the dormant condition. All the trees were finally transferred to a greenhouse about 1st December. The seven trees which took yellows were exposed to the infective insects in July. Evidence was obtained which suggested that there may be a long incubation period for the virus in the insect.

One tree which took the disease was exposed for only two days, another for six, and the remainder for longer periods. Four trees showed well-marked symptoms 78, 86, 94, and 173 days, respectively, after exposure, the remaining three showing the symptoms after 186 days.

In the three trees which first showed signs of yellows the symptoms appeared as they began to lose their leaves; instead of becoming fully dormant as the weather grew cold, some of the branches continued to grow, producing characteristic, tender secondary shoots. All the other trees exposed to *M. trimaculata* as well as the control trees lost their leaves. As the trees began to grow when removed from the cold frames to the greenhouse the three that had shown yellows when in the frames and four others of those exposed to *M. trimaculata* became badly yellowed, though 133 control peach trees and 60 peach trees exposed to another insect were still healthy one year later.

GRUBER (F.). **Beerenobstzüchtung.** [Berry fruit breeding.]—*Der Züchter*, iv, p. 237, 1932. [Abs. in *Fortschr. der Landw.*, viii, 11, p. 258, 1933.]

The first attempts to carry out a systematic programme of berry fruit breeding in Germany are stated to have been initiated at the Kaiser Wilhelm Institute for Breeding Research, Müncheberg, Mark Brandenburg, where experiments are in progress in the selection of raspberries resistant to *Didymella applanata*, currants to *Gloeosporium* [*Pseudopeziza*] *ribis*, and gooseberries to American mildew (*Sphaerotheca mors-uvae*). In connexion with the last-named disease promising results have already been obtained.

HARRIS (R. V.). **The Strawberry 'yellow-edge' disease.**—*Journ. Pomol. and Hort. Science*, xi, 1, pp. 56–76, 4 pl., 2 figs., 1933.

An account is given of experiments in 1931 and 1932 at the East Malling Research Station, Kent, the results of which showed that a disease of the Royal Sovereign strawberry first seen in 1930 and suspected to be of the virus type, is transmissible by grafting [by a method which was described in an earlier publication: *Journ. Pomol. and Hort. Science*, x, 1, pp. 35–41, 1932], and is independent of mite (*Tarsonemus fragariae*) and insect infestation or other external causal factors.

One of the most marked features of the disease is that during the two years in which it has been under close observation, the diagnostic leaf symptoms were completely manifested only from the middle of September until the end of October; although individual plants showed symptoms before and after this critical period, the freedom or otherwise of a given plant from infection could not be established even tentatively until this period was reached. In this respect, as well as in other symptoms, this

disease (for which the descriptive name 'yellow edge' is suggested) closely resembles the American strawberry xanthosis [*R.A.M.*, vii, p. 650]. During the critical period, the general appearance of the 'yellow edge' plants is very characteristic, the plant being abnormally flattened and consisting of a zone of more or less normal outer leaves surrounding a central zone of diseased young leaves. The latter exhibit a chlorosis or yellowing confined to the marginal areas, invariably accompanied by a general dwarfiness, an irregular curling (mainly upwards) of the margins, a downward curling of the midrib, and a twisting of the whole lamina. The petiole is abnormally short, stout, and lacking in red pigmentation. The intensity of these symptoms varies with the stage of attack reached, and ranges from very slight stunting, distortion, and discoloration, to the production, in advanced cases, of a tight rosette of extremely dwarfed, distorted, and chlorotic leaves entirely lacking in red pigmentation. The outer zone of leaves in naturally or artificially infected plants was observed to develop the autumn red colour earlier than healthy plants.

Analogous symptoms were also seen on eleven other varieties of strawberry, in particular on Stirlingworth and Stirling Castle, and the fact that when a diseased plant of the last-named variety was grafted on a healthy Royal Sovereign plant the latter became typically diseased is considered to indicate the identity of the infective principle concerned. There was clear evidence that the varieties differed in their relative susceptibility; there was a further suggestion that strains of a single variety may also differ in this respect, and further work is in progress to test this point, and also to determine the possible vectors of the disease, with special reference to the Tarsonemid mite which has been found on yellow edge plants with remarkable constancy.

The paper terminates with a brief consideration of possible control measures, among which elimination by roguing is thought to be the most promising, since field observations showed that the virus can pass from an infected plant into all of its vegetative progeny during the course of a single season.

CARTER (W.). **The Pineapple mealy bug, Pseudococcus brevipes, and wilt of Pineapples.**—*Phytopath.*, xxiii, 3, pp. 207–242, 9 figs., 2 diags., 1 graph, 1933.

A comprehensive account is given of the writer's investigations on pineapple wilt in Hawaii, the results of which confirmed J. F. Illingworth's evidence as to the transmission of the disease by mealy bugs (*Pseudococcus brevipes*) following their feeding on infected plants [*R.A.M.*, xi, p. 191 and next abstract]. Two main types of wilt are differentiated, namely, quick and slow, the former (from which recovery is common) occurring chiefly on young plants after a short period of feeding by a fairly large insect colony, and the latter resulting from the development of the mealy bugs for a considerable time on the leaves. The colour changes associated with quick wilt are very striking, ranging from yellow or yellowish-brown to bright pink or red, while plants affected by the slow type show a number of green or chlorotic spots—the old feeding-points of the insects, and a brown discoloration, shrivelling, and drooping

of the outer leaf tips, frequently accompanied by secondary necrosis. The actual cause of the disturbances in question seems to be a non-living toxic insect secretion of variable diffusibility.

CARTER (W.). **The spotting of Pineapple leaves caused by Pseudococcus brevipes, the Pineapple mealy bug.**—*Phytopath.*, xxiii, 3, pp. 243–259, 3 figs., 2 diag., 1933.

Two general types of spotting of pineapple leaves are associated with invasion by *Pseudococcus brevipes* [see preceding abstract], one being the chlorosis characteristic of coccid feeding generally, while the other assumes the form of a green spotting of very erratic occurrence. Thus, colonies of mealy bugs have been maintained for long periods without any development of green spot; for similar periods with the constant formation of green spots; or green spots may be produced at intervals. Mealy bugs from non-green-spotting colonies failed to produce these lesions even after feeding on green-spotted tissue. The capacity to form green spots was found to be transmissible from the mother to a part of her progeny and to be limited to certain individuals within a colony. Based on a preliminary study, the working hypothesis has been evolved that the insect's secretions are conditioned by the activities of the associated mycetome and its two types of included symbionts [details of which are given: cf. *R.A.M.*, v, p. 31; vii, p. 512].

SERRANO (F. B.) & PALO (M. A.). **Blossom-blight of Mangos in the Philippines.**—*Philipp. Journ. of Sci.*, l, 3, pp. 211–277, 17 pl. (1 col.), 1933.

In connexion with a study of blossom blight of the mango, caused by two leafhoppers, *Idiocerus clypealis* and *I. niveosparsus*, in the Philippines, the writers give a short note on anthracnose (*Glomerella cingulata*) [*R.A.M.*, ix, p. 230] which is generally of minor importance but may be responsible for heavy damage in seasons marked by several days' continuous rainfall during the flowering period (normally January to April). Late flowering trees were severely attacked towards the end of May, 1932, as a sequel to a week's successive rain from the 12th onwards. Both the flowers and young fruits are destroyed by the fungus.

PAOLETTI (V.). **Osservazioni ed esperimenti orientativi di lotta contro la rogna dell'Olivo.** [Tentative observations and experiments for the control of Olive knot disease.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 47–50, 1933.

An investigation into the olive knot disease (*Bacterium* [*Pseudomonas*] *savastanoi*) [*R.A.M.*, vii, p. 725; viii, p. 547], which during the last ten years has become increasingly prevalent in certain parts of Italy, showed that the most resistant trees are those with the toughest bark which does not readily crack or become injured by meteorological conditions. Two or three months after long cuts had been made in the bark of affected trees, new tumours were invariably present in the lesions, indicating bacterial entry through such wounds. The spread of the disease is strongly favoured by rain.

The pruning of badly knotted trees facilitates ingress of the

bacteria and generally weakens the condition of the trees. Applications of stable manure produce soft tissues, with the result that the bark is less able to resist traumatic injury. On the other hand, spraying with Bordeaux mixture, by protecting the leaves against *Cycloconium* [*oleaginum*: ibid., x, p. 130], markedly improves the condition of affected trees as a whole.

On badly affected trees the tumours arise where the rain collects on the bark or where it runs down along the trunk. The serious destruction of bark on young olives is due to rain water containing the bacteria collecting in the long cracks caused in the trunk by traumatism or increase of girth.

Two years' tests clearly demonstrated that effective control [cf. ibid., v, p. 679] is given by making four applications per year to the entire tree of Bordeaux mixture containing 1 to 2 per cent. copper sulphate, the first application being made at the end of December, just after picking (as a protective covering to the injuries incidental to the harvesting), the second at the end of February (to protect against the results of hail injuries), the third at the onset of the spring rains, i.e., 1st to 10th April, and the fourth before the autumn rains set in, i.e., 1st to 15th September. An annual application of 2 to 4 kg. mineral superphosphate should be given to each affected tree in the place of stable manure, and pruning should be discontinued for at least two years in succession. Trees so treated recover, form a luxuriant, dark green foliage and give an abundant yield ; the old excrescences dry up, and it is very seldom that any new ones form.

Briton-Jones (H. R.). **Preliminary trials with a combined insecticide and fungicide.**—*Trop. Agriculture*, x, 3, pp. 80-84, 1933.

A brief account is given of the author's tests of a cheap [mineral] oil product prepared by a Trinidad oil company, the results of which showed this substance to be of value in the control of the cacao witches' broom disease [*Marasmius perniciosus*: *R.A.M.*, xii, p. 207], since it readily killed the delicate growing points of the host, thus reducing the liability to infection [ibid., x, p. 658]. Further experiments indicated that at concentrations non-injurious to plant growth, the substance very effectively killed various types of noxious insects, and gave promise of being also effective against fungi, although it did not appear to be protective against new infections. It was found, however, to be a true solvent of sulphur which, on dilution of the solution with water and exposure to the atmosphere, is converted by oxidation into colloidal sulphur, the fungicidal and protective properties of which are well known. This sulphur-oil compound is marketed under the name 'sulphemulsol' at the price of 30 cents. (1*s.* 3*d.*) per gall. f.o.b. Trinidad in non-returnable drums, and preliminary trials showed that at the strength of 3 per cent. it effectively controlled various types of insect pests on several varieties of citrus trees without injury to the trees in fruit, although trees in blossom were somewhat injured. The indications were also that the compound will control fungous diseases amenable to treatment by spraying, and it is thought probable that spraying citrus trees in the grove may tend to keep

down storage rots, owing to the (invisible) deposit on the sprayed fruit of colloidal sulphur. Laboratory tests showed that when cacao pods artificially infected with the black pod fungus (*Phytophthora palmivora*) [ibid., xii, p. 207] were sprayed with, or dipped in, a 2 per cent. solution of sulphemulsol, the fungus on the pods was effectively killed, the results comparing favourably with those obtained with 2 per cent. Burgundy mixture. Finally, steeping sugar-cane cuttings in 5 per cent. sulphemulsol for ten minutes or for 30 minutes in a 2 per cent. solution, did not affect the germinability of the setts. The fungicidal efficacy of the compound on a field scale has not yet been tested, though Petri dish and other laboratory tests have all given good results.

JANKE (A.) & BERAN (F.). **Über die mikrobicide Wirkung von organischen Säuren und ihren Kupfersalzen. Ein Beitrag zum Problem des Zusammenhangs zwischen chemischer Konstitution und mikrobicider Wirkung.** [On the microbicidal action of organic acids and their copper salts. A contribution to the problem of the connexion between chemical constitution and microbicidal action.]—*Arch. für Mikrobiol.*, iv, 1, pp. 54–71, 1933.

At the Vienna Plant Protection Institute fourteen copper salts of organic acids, ten corresponding free acids and inorganic copper salts (sulphate and chloride), cadmium acetate, and bismuth salicylate were tested at varying concentrations for their action on a number of bacteria and two fungi, *Trichothecium roseum* and *Sclerotinia cinerea*.

The results [which are tabulated and discussed] showed that *T. roseum* was killed by 10 minutes' exposure to formic acid (P_H 5, $\frac{1}{2}$ mol., $\frac{1}{2}$ equivalent per l.) and by the same compound, unbuffered (2 mol., 2 equiv.) in 5 minutes; acetic acid (P_H 5, 4 mol., 4 equiv.) killed the same fungus in 5 minutes, as also did benzoic acid ($\frac{1}{20}$ mol., $\frac{1}{20}$ equiv.), salicylic acid ($\frac{1}{50}$ mol., $\frac{1}{50}$ equiv.), phenol ($\frac{1}{2}$ mol., $\frac{1}{2}$ equiv.), and copper salicylate ($\frac{1}{10}$ mol., $\frac{1}{5}$ equiv.). *T. roseum* was not injured by exposure to copper sulphate (2 mol., 4 equiv.) for periods up to 360 minutes, and succumbed to copper chloride (4 mol., 8 equiv.) only after 180 minutes.

S. cinerea was killed in 5 minutes by formic acid (P_H 5, $\frac{1}{2}$ mol., $\frac{1}{2}$ equiv.), in 30 minutes by acetic acid (2 mol., 2 equiv.), in 5 minutes by butyric acid (1 mol., 1 equiv.) and phenol ($\frac{1}{2}$ mol., $\frac{1}{2}$ equiv.), and in 10 minutes by copper salicylate ($\frac{1}{10}$ mol., $\frac{1}{5}$ equiv.). The growth of this fungus on removal from the solution was not impaired by exposure to copper sulphate (2 mol., 4 equiv.) for periods up to 360 minutes, while copper chloride (4 mol., 8 equiv.) exercised an inhibitory effect only after 180 minutes.

VELTHORST (H.). **Die konservierende Wirkung einiger Para-oxybenzoësäure-Ester.** [The preservative action of certain para-oxybenzoic acid esters.]—*Pharmazeut. Monatshefte*, xiii, 9, pp. 199–202, 1932.

The results [which are summarized and tabulated] of a series of tests at Utrecht University on the preservative action on foodstuffs of the para-oxybenzoic acid esters (on the market under the names

of nipasol and nipagin) [*R.A.M.*, xi, p. 466] indicate that the effects of these preparations are too uncertain and irregular to warrant their general recommendation in place of benzoic acid. In some cases mould and bacterial growth was entirely suppressed, while in others the disinfectant action was quite insufficient. Under Dutch law the use of benzoic acid is permitted for certain purposes in food preservation.

READ (W. H.) & ORCHARD (O. B.). **Plant injury following the burning of sulphur in vacant glasshouses.**—*Journ. Min. Agric.*, xxxix, 12, pp. 1085–1087, 1933.

Chrysanthemums grown in 1932 at the Experimental and Research Station, Cheshunt, were observed a few days after their removal into glasshouses, that had been disinfected by burning sulphur, to develop a severe scorch of their foliage, stems, growing tips, and buds, occasionally resulting in the complete loss of the flowers. The injury was traced to drippings from overhead galvanized wires and surfaces covered with a paint containing zinc oxide. Such drippings, caused by the condensation of moisture in the glasshouses, especially after damp or foggy nights, were found to contain high concentrations of zinc sulphate resulting from the oxidation in a damp atmosphere of the sulphite formed by the action of the sulphur dioxide produced during disinfection on the zinc-containing surfaces, and a similar type of injury was experimentally reproduced by splashing chrysanthemum plants with solutions of zinc sulphate at concentrations over 0·33 per cent.

The trouble may be greatly minimized by thoroughly hosing down the painted surfaces with water at frequent intervals when the glasshouses are wet, or by maintaining a dry atmosphere in the latter. The use of paint with a lead or barium base would also be a means of counteracting the trouble, another alternative being the use of naphthalene or formaldehyde instead of burning sulphur for the disinfection of the glasshouses. Sulphur dusting was shown to have no detrimental action in the glasshouses where zinc paints were used.

STANER (P.). **La phytopathologie au Congo belge.** [Phytopathology in the Belgian Congo.]—*Rev. des Questions Scient., 20 Nov., 1932*, pp. 437–452, 1932.

The greater part of this paper is an historical outline of the development of the phytopathological service in the Belgian Congo since its inception in 1910, including the description, year by year, of the work done in the study of the chief fungal diseases and insect pests which attack economically important crops in that colony.

HASELHOFF (E.), BREDEMANN (G.), & HASELHOFF (W.). **Entstehung, Erkennung und Beurteilung von Rauchschäden.** [The origin, recognition, and assessment of smoke injuries.]—xii + 472 pp., 36 figs., Berlin, Gebr. Borntraeger, 1932. [Abs. in *Fortschr. der Landw.*, viii, 11, pp. 259, 1933.]

This is stated to be a comprehensive survey of the results of research on the effects of smoke gases on plant growth [*R.A.M.*, v, pp. 67, 396; vii, p. 352 *et passim*]. The aspects of the problem

discussed include the origin and composition of smoke from factories and the like, the external characters and extent of smoke injury, and the detection of gases in the atmosphere. A special section is devoted to chemical and botanical investigations of the injuries caused by the various gases and emanations. The legal side of the smoke injury question is also fully considered.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **Stream double refraction exhibited by juice from both healthy and mosaic Tobacco plants.**—*Science*, N.S., lxxvii, 1994, p. 284, 1933.

In previous experiments the writers found that the juice from frozen, healthy tobacco leaves failed to show the stream double refraction characteristic of that from similarly treated mosaic foliage [*R.A.M.*, xii, p. 401]. In recent tests, however, the juice from unfrozen healthy leaves exhibited marked stream double refraction. The phenomenon was not manifested by juice from unfrozen healthy tobacco leaves subjected to treatment with safranin [ibid., xii, p. 332]. These data apparently indicate that all the detectable double refractive material was removed from the healthy juice, but not from the infective, by the purification process, and suggest that much or all of the doubly refractive material in the diseased plant juice may be different from that in the healthy. It cannot, however, yet be definitely asserted that the virus particles are responsible for all or part of the double refraction shown by diseased plant juice.

SHEFFIELD (F[RANCES] M. L.). **The development of assimilatory tissue in Solanaceous hosts infected with aucuba mosaic of Tomato.**—*Ann. of Appl. Biol.*, xx, 1, pp. 57–69, 3 pl., 1933.

Continuing her investigations of the aucuba mosaic of tomato [*R.A.M.*, xi, p. 335 and next abstract], the author gives details of her comparative study of the development of the chloroplasts in normal tomato, tobacco, and *Solanum nodiflorum* plants, on the one hand, and in the same hosts after infection with aucuba mosaic, on the other. In normal plants the origin of the plastids was traced back to certain minute, slightly elongated granular bodies which are present in the young cells of the primary meristem of the shoots, and which cannot be differentiated from chondriosomes either by their shape or by their chemical reactions. After cell division in the meristematic tissue has ceased, these bodies begin to enlarge; a vacuole is formed in each, and grows bigger as the protoplastid increases in size; a starch grain (occasionally two or three) is formed in the vacuole. The outer stroma of the protoplastid then becomes pigmented and numerous pores are formed in it. The chloroplasts were seen sometimes to divide.

In plants infected with aucuba mosaic, certain of the leaf tissues were seen to be devoid of plastids, their absence being caused by an inhibitory effect of the virus on the development of the primordia, which are usually destroyed in a very early stage; failing this, perfectly normal plastids are formed in the diseased tissues. While mature plastids were never observed to be affected by the virus, intermediate stages may be so affected. The cells of the affected leaf tissues may be undifferentiated.

Although intracellular inclusions [loc. cit.] do not occur in the meristematic tissue, incipient bodies were seen in cells which were increasing in size and after the development of plastids was well advanced. This would explain the indiscriminate formation of intracellular inclusions in green and chlorotic areas on the presumption that the virus in such cases reaches the green tissue too late to inhibit the development of the plastids. No definite evidence was obtained to show whether the prevalence of the inclusions in tegumentary tissues and their rarity in assimilatory tissue is due to differences in the P_H of these tissues.

SHEFFIELD (F[RANCES] M. L.). **Virus diseases and intracellular inclusions in plants.**—*Nature*, cxxxi, 3305, pp. 325–326, 1 fig., 1933.

An investigation was conducted at Rothamsted Experimental Station to determine whether reactions in certain Solanaceae similar to those induced by inoculation with aucuba mosaic of tomato [see preceding abstract] could be stimulated by physico-chemical means.

Healthy tomato, *Solanum nigrum*, and *S. nodiflorum* plants were treated with small doses of chemical substances known to cause protoplasmic coagulation, viz., mineral acids and salts and organic compounds such as acids, alcohols, and alkaloids. Each of the reagents produced, in a greater or lesser degree, symptoms recalling the first microscopic evidence of virus infection; the cytoplasm became increasingly conspicuous and its streaming was accelerated. Hyaline spheres, resembling the bodies accompanying certain virus diseases, were also formed in some cases but failed to persist for any length of time. Molybdenum, given in the form of molybdic acid or its ammonium or sodium salts, induced in the cells processes analogous to all stages of an attack of aucuba mosaic. Soon after treatment began, the cytoplasm appeared to increase in volume and stream more rapidly; minute, yellowish particles were carried about the cell and coalesced when brought together by the flowing of the plasm, until by successive fusions a single large mass was gradually built up. In its final stage the body was rougher in outline and slightly more granular than those produced by aucuba mosaic, which it resembled, however, in all essentials. None of the other radicles produced effects so closely simulating those of aucuba mosaic.

SAMUEL (G.) & BALD (J. G.). **On the use of the primary lesions in quantitative work with two plant viruses.**—*Ann. of Appl. Biol.*, xx, 1, pp. 70–99, 1 pl., 1 diag., 5 graphs, 1933.

In this paper the authors describe in some detail their attempts to apply Holmes's method [*R.A.M.*, viii, p. 138; xi, p. 333 *et passim*] to the quantitative study by means of local lesions of the viruses of tobacco mosaic 1 (obtained from J. Johnson) and of spotted wilt of tomato [ibid., xii, p. 59]. The experiments [the results of which were checked by statistical methods] were made on *Nicotiana glutinosa* plants for the tobacco mosaic, and on tobacco plants (Blue Pryor mainly, but White Burley is stated to be as good for this purpose) for tomato spotted wilt. In the

course of the work they evolved the following standardized method, which they used in their later quantitative studies. Good batches of the experimental plants were raised from seed obtained from a single self-fertilized plant (tobacco or *N. glutinosa*), the seedlings being grown under the best conditions, and all being treated alike as regards transplanting and watering with soluble fertilizers. A few days before being used for an experiment, the plants were sorted out into the groups required by taking first the largest and putting one in each group, then the next largest, and so on until the groups were complete and as even as possible to the eye. The *N. glutinosa* plants were trimmed down to five leaves, and kept three to five days before inoculation. The latter was done with an elongated ground-glass spatula, the flattened end of which was about 1¼ inch long to fit comfortably across half the leaf blade of *N. glutinosa*. The spatula was dipped into the virus so as to lift plenty of liquid to cover the half-leaf, and was drawn gently but firmly over the half-leaf from stem end to tip, the leaf being supported on the hand covered with a fresh square of newspaper; a single rub was found to be sufficient. If the virus tested was more concentrated than 1 in 10, after inoculation of the five half-leaves on a plant, the excess virus was immediately washed off with sterilized water, care being taken not to wet the opposite half-leaves, which were inoculated with the other virus under test (the tests were mainly different dilutions of the same virus or comparisons of the strengths of the same virus from different sources) after the whole group of five or ten plants had been inoculated with the first virus. In the case of spotted wilt inoculations on tobacco, owing to the larger size of the leaves, the spatula was usually drawn down at the same angle as the lateral veins, once over each interveinal space until the whole leaf was covered. When the inoculations had to be made quickly, however, the cheese-muslin method was used. Counts of the localized lesions were made 6 to 8 days after inoculation.

The paper terminates with a brief description of the results obtained by this method in the study of the virus concentrations obtained from different sources, the content in virus of necrotic primary lesions as compared with non-necrotic ones, the increase of spotted wilt virus in the tops of infected tomato seedlings, and of the effect of physical and chemical agents on the viruses.

CALDWELL (J.). **The physiology of virus diseases in plants. IV. The nature of the virus agent of aucuba or yellow mosaic of Tomato.**—*Ann. of Appl. Biol.*, xx, 1, pp. 100–116, 1 graph, 1933.

Continuing his studies of the virus of the aucuba mosaic of tomato [*R.A.M.*, xi, p. 754], the author gives details of experiments in which he inoculated *Nicotiana glutinosa* plants with various dilutions of the virus by rubbing the surface of the leaves with the tip of the index finger dipped in the inoculum, an attempt being made to break the hairs on the adaxial side without, so far as possible, damaging the mesophyll tissues. The infectious material was prepared by adding 2 c.c. of water to 1 gm. of pulp from crushed aucuba mosaic tomato or tobacco leaves, left standing

for 24 hours, filtered through fuller's earth, and then used as stock material, from which dilutions were prepared. In preliminary tests, high concentrations of the virus were shown not to be suitable for quantitative work [see preceding abstract], since some factor, possibly the number of hairs broken, limited the number of local lesions produced; it was shown, however, that dilutions of about 1 in 50 and higher were quite satisfactory, though even at these dilutions there was considerable individual variation and it was not possible accurately to foretell the strength of the inoculum tested from the intensity of the symptoms on the plant from which it was derived.

The results of the experiments [some of which are presented in the form of tables] indicated that with the higher dilutions the number of spots formed is directly proportional to the amount of dilution, this offering a strong presumptive evidence of the particulate nature of the virus, and suggesting that each particle or group of particles is able to induce the appearance of a necrotic spot. No evidence was obtained to show that shaking of the virus inoculum increased the number of the particles present in it, after the juice tested had been freed by filtration from cell débris, nor did the addition of proteolytic enzymes to the inoculum increase their number.

The paper also includes a brief outline of a method which is believed to be capable of giving an approximate idea of the number of virus particles present in any given virus; it terminates with a brief description of experiments which showed that the multiplication of the aucuba mosaic virus is enormously greater in the tissues of the tomato than in those of *N. glutinosa* (roughly of the order of 40 to 1).

Legislative and administrative measures. Italy.—*Internat. Bull. of Plant Protect.*, vii, 3, p. 61, 1933.

By a Ministerial Decree of 20th December, 1932, effective as from 1st March, 1933, the importation into Italy of plants and plant parts of the genera *Abies*, *Picea*, *Pinus*, *Pseudotsuga*, and *Tsuga* is prohibited. Other conifers may be imported subject to certification by the competent authorities as to freedom from *Rhabdocline pseudotsugae* [*R.A.M.*, xii, p. 258 *et passim*] and other dangerous diseases and pests.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 3, p. 23, 1933.

Norway. By a Royal Decree dated 4th February, 1933, with immediate effect, the importation into Norway of living hop plants and cuttings is prohibited to avoid the risk of introducing the fungus *Peronospora* [*Pseudoperonospora*] *humuli*.

United States Department of Agriculture. Bureau of Plant Quarantine. Notice of lifting phony Peach disease quarantine.—1 p., 1933.

As from 1st March, 1933, the phony peach disease quarantine placed by Notice of Quarantine No. 67 on certain States and parts of States of the Union [*R.A.M.*, xi, p. 543] is revoked.